AVIATION WEEK

A McGRAW-HILL PUBLICATION

DEC. 26, 1955

50 CENTS

Grumman

1930 1955

No paper tiger

For keeping peace, some call our country a paper tiger. They err. Our strength, like the Navy's new F11F-1, is not on paper. This Tiger by Grumman is real. This Tiger is small and supersonic and will prey on enemies if attacked. To be ready in quantity when needed, Grumman designed and built the first Tiger in 15 months. Until Tigers join the fleet in quantity, Grumman Cougars will help the Navy police the sky and keep peace.

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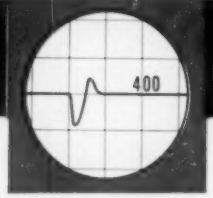

Sundstrand Constant Speed Drives foster new electrical concepts in B-47E

New concepts of an aircraft electrical system, as demonstrated by the startling improvement in the B-47E over earlier models, can be attributed in great part to the Sundstrand Constant Speed Drive. Stable electrical power—availability of 80 KVA from the *first automatically paralleled alternators used in a production airplane*, plus close control of frequency and voltage—brought new reliability and new effectiveness to the Auto-Pilot and "K" Bombing System. These automatic navigation, identification, and bombing systems now operate at optimum level, increasing the B-47E's effectiveness as a modern weapon. A Sundstrand-driven electrical system can help solve *your* problem—write us.

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CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES

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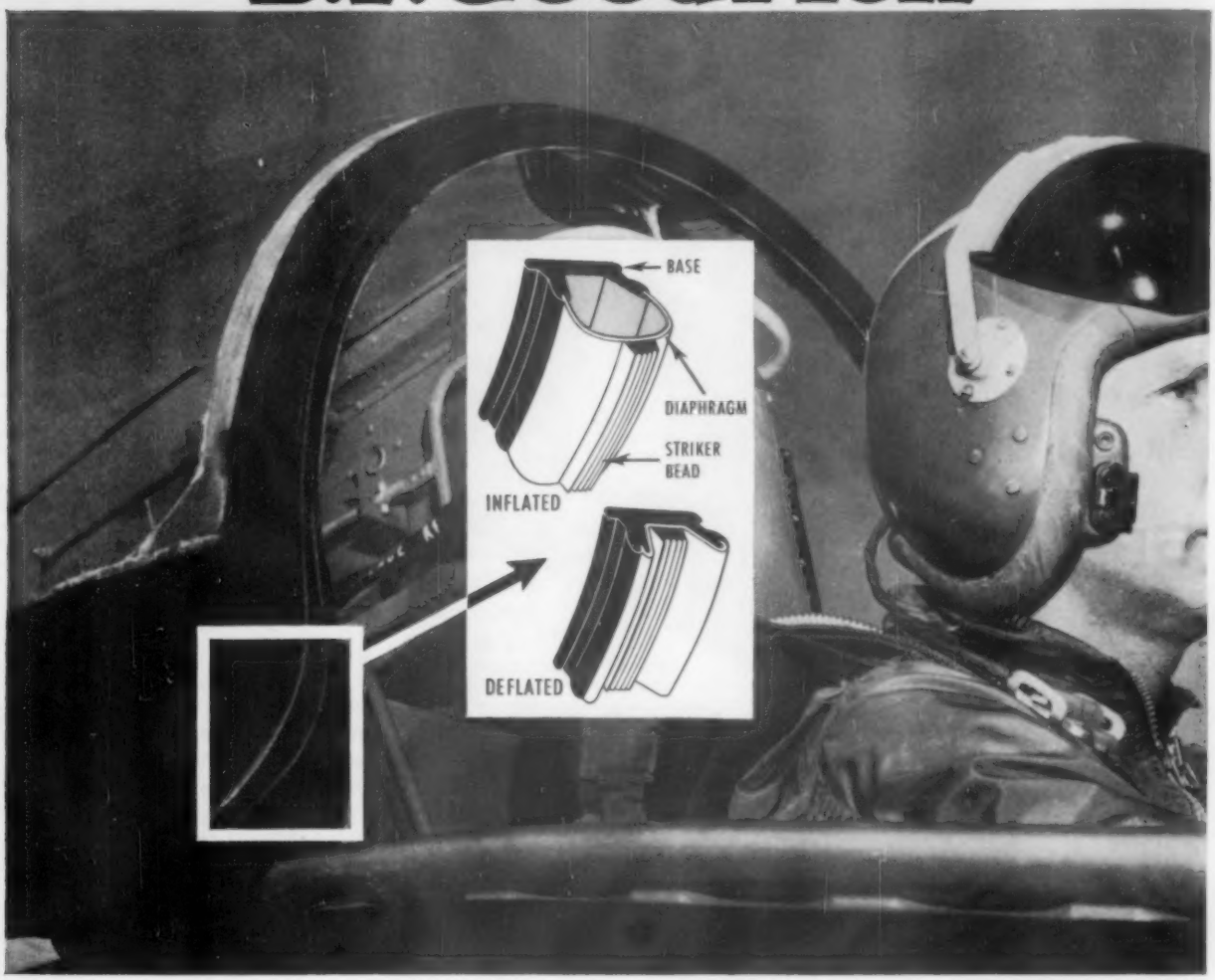

Low pressure seal prevents high altitude blowouts

FIGHTER PILOTS used to face serious "blowout" trouble in high altitude combat. The severe effect of high pressure inside the canopy, low pressure outside, would pop the inflatable seal between the canopy and fuselage. Because this rubber seal had to stretch like a balloon to make an airtight fit — it couldn't take the strain. Positive pressure without stretch—like blowing up a paper bag — was needed.

B. F. Goodrich engineers developed a patented inflatable band of rubber that seals under low pressure without strain. A special rubber-coated fabric diaphragm is cured to a solid rubber base. When inflated, the rubberized fabric lifts a "sealing bead" against the canopy to make an air-tight seal with no stretching of the rubber.

The new inflatable strip seal works almost instantly. Even at minus 65° it inflates with less pressure than ordinary seals needed at room temperature. There are other advantages. It resists wear and damage better than ordinary seals. It fits complex curves better. It seals and unseals faster. Sliding wear and scuffing are minimized.

The new B. F. Goodrich seal is now in use on more than two dozen makes and models of the latest jet fighters and bombers. The North American FJ-3 Fury, above, is one example. *The B. F. Goodrich Co., Tire and Equipment Div., Aeronautical Sales, Akron, Ohio.*

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DECEMBER 26, 1955

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Defense Seeks $2 Billion Budget Jump 12
▶ Bulk of new money for USAF and guided missiles; Wilson sees three stable years for aircraft industry.

Israeli Report on El Al Crash over Bulgaria 51
▶ Airliner with 58 aboard shot down by Communist jets without warning after straying from flight path.

Examiner Urges Tigers, Slick Renewals 79
▶ Mail and air express carriage would be permitted without subsidy payment for seven-year period.

AERONAUTICAL ENGINEERING

Hydro-Skis for Martin Mariner 25
De Havilland Packages Trainer 32

HUMAN FACTORS

Rocking Is Bailout Hazard 21
Design Data for Supersonic Ejection .. 22

MANAGEMENT

A Message From the Publisher 7
$8 Billion Industry Predicted 13
More Bid Contracts Demanded 14
Industry Faces Army Challenge 15
Advertising Proposal 25
Certificates of Necessity 25
Who's Where 9
Industry Observer 9
Washington Roundup 11

PRODUCTION

One-Piece Castings Slash Plane Weight 37
Production Briefing 40

TRANSPORT

SAS Buys Douglas Jets 14
Boeing Reveals Noise Suppressor 18
'Near Miss' Report Considered by CAB. 32
Scheduled Lines Protest Nonsked Ruling 80
ATA Increases Budget 82
Frontier 82
CAB Orders 83
Cockpit Viewpoint 83

BUSINESS FLYING

Beech Breaks Fast Toward '56 Record 42
Private Plane Entry to Mexico Eased .. 43
NBAA Begins Program on Pitfalls 43
Auster Agricola Starts Flight Test 45
Private Lines 45

AVIONICS

New Tests for Fire-Control Accuracy ... 26
Filter Center 31

Calendar 8

EDITORIAL

Congress Should Investigate CAA 94

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RESEARCH AND MARKETING

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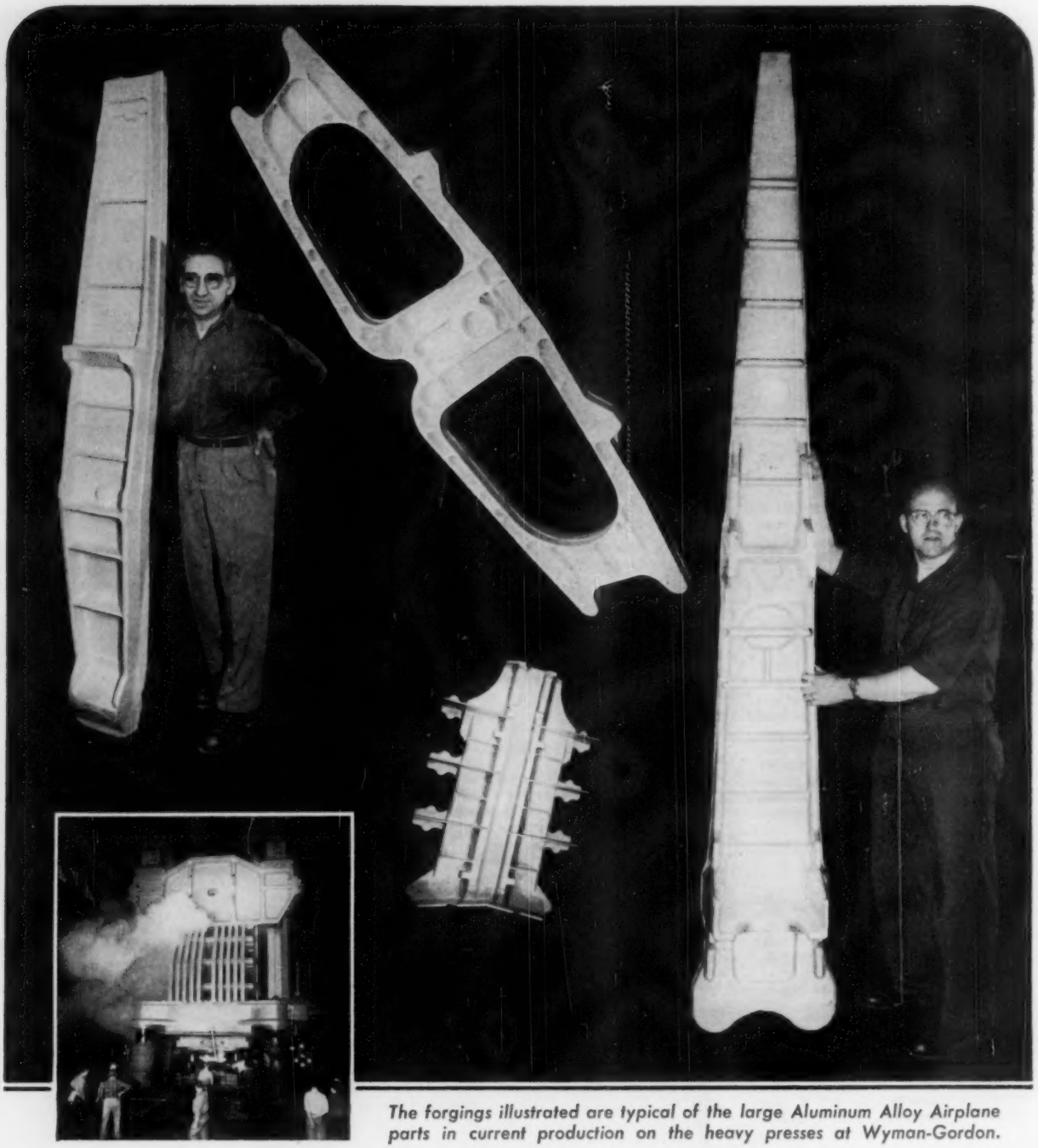

The forgings illustrated are typical of the large Aluminum Alloy Airplane parts in current production on the heavy presses at Wyman-Gordon.

A new era in the art of forging has been demonstrated as production goes forward on this 35,000-ton closed die forging press. Larger forgings with thinner sections and closer tolerances than heretofore possible open new concepts in forging design. Wyman-Gordon continues to pioneer by — Keeping Ahead of Progress.

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A Message From the Publisher

Aviation is completing its most successful year. Building and maintaining the strongest military airpower is an integral part of national policy. Air transport expansion continues at a record pace. Business flying is the most rapidly growing segment of civil aviation. Technical progress has opened the realm of supersonic flight and is poised on the threshold of space.

AVIATION WEEK's growth during 1955 also established new records for aviation publications in editorial impact and readership, paid circulation growth and advertising acceptance. Under the leadership of its editor, Robert B. Hotz, an expanded editorial staff set a new standard of reporting the many facets of the industry's technical, financial and political growth. Its exclusive editorial content was widely used by the management of airlines, aircraft and avionic manufacturing firms, engineering staffs, legislators and military aviation officials in the conduct of their business.

Editorial Impact

AVIATION WEEK's exclusive editorial report on the growth of Russian jet airpower and its impact on American military planning was quoted authoritatively on the front pages of 257 American newspapers and translated into four foreign languages. It stimulated editorial comment in 113 daily newspapers and by nationally syndicated columnists, television commentators and radio broadcasters. It was widely credited with influencing a major change in military policy, resulting in an accelerated aircraft production program and an expanded research and development effort. During the year, AVIATION WEEK was authoritatively quoted in military airpower debates on the floor of the U. S. Senate and the British House of Parliament.

Among other major stories of the year brought exclusively to AVIATION WEEK readers were the first complete and accurate account of the area rule supersonic technical breakthrough by scientists of the National Advisory Committee for Aeronautics; new Air Force procurement, research and development policies; the development of a new avionic airways system, and full-scale engineering reports on the newest jet transports—the Douglas DC-8 and the Lockheed Electra. AVIATION WEEK's editorial coverage expanded into the new fields of missile engineering, human factors and astronautics. It also provided the aircraft industry with a new service by publishing the first annual Buyers' Guide containing 596 pages and 37,000 product listings. Our editorial staff was augmented until it now contains the largest group of engineering writers and graduate engineers in the aviation publishing field. Key editorial bureaus in Washington and Los Angeles were also enlarged with experienced aviation reporters.

This editorial expansion program is still under way. During 1956, it will bring our readers a new format designed for easier readability, editorial covers and continued exploration of the new technical fields into which aviation is spreading. AVIATION WEEK is now being printed on new high-speed presses that enable us to produce the magazine faster.

New Advertising Peak

I believe AVIATION WEEK readers would also like to know something of the tremendous advertising record compiled during 1955. We published 4,298 pages of advertising during the year, representing an increase of 778 pages over 1954. This gain represented a total larger than the combined increase of the next three major aviation publications. Once again AVIATION WEEK is represented by an improved position in the select group of the nation's 20 largest magazines, a distinction that no other aviation publication has attained. This acceptance of AVIATION WEEK by the aircraft industry is the result of a firm, independent and vigorous editorial policy which has attracted the largest net paid audience of engineering, management and military subscribers in the aviation industry. Our net paid circulation as reported by the Audit Bureau of Circulation for the period ending June 30, 1955, stood at 51,893. Our current net paid is 55,190. We will continue to expand circulation during 1956 to reach engineers, scientists and top-level management of the new firms being drawn into the aviation market by their special technical skills.

Expanding Industry Prospects

Our research indicates further expansion for the aviation industry during 1956 and a continued period of growth stretching at least until 1960. An increase of $1 billion in Fiscal 1957 defense expenditures over the $34 billion spent during Fiscal 1956 will be devoted almost entirely to aircraft, avionics and guided missiles. New money requested for Fiscal 1957 will increase by $2 billion, most of it earmarked for aerial weapons. Close to $25 billion in federal funds is now available for the aircraft, avionic and missile programs. Combined with the increasing demand for new type airline transports and executive planes, this military program will keep the manufacturing industry operating at peak production with greatly expanded research and development efforts. Airline prospects, stimulated by the jet-transport development and a federal regulatory policy favoring growth, also appear bright for years to come.

Expansion of the aircraft industry has brought a new challenge to its management and technicians as well as to the aviation publications that serve it. AVIATION WEEK will continue to expand its activities and to explore new possibilities for providing better service to both its subscribers and advertisers.

—Robert W. Martin, Jr.

as others see us . . .

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Engineers
Berea, Ohio

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Our recent use of Aetco's services had enabled us to complete our projects with efficiency and dispatch, and Aetco's impartial, comprehensive and certified test reports were a strong factor in reduction of controversy and time towards the obtaining of approvals on our projects.

We particularly appreciate Aetco's flexibility to adapt almost any type of testing procedure with minimum delay. Their large testing chambers can accommodate almost any size product in the aircraft field. One project included a 5 gallon piston type accumulator, which Aetco successfully tested without any contingencies.

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AVIATION CALENDAR

Jan. 9-10—Second National Symposium on Reliability and Quality Control in Electronics, sponsored by Institute of Radio Engineers, Hotel Statler, Washington.

Jan. 9-13—Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler Hotels, Detroit.

Jan. 10-11—Yankee Instrument Fair & Symposium, sponsored by Instrument Society of America-Boston Sec., Sherry Biltmore Hotel, Boston, Mass.

Jan. 12—Conference on Airport Financing Problems in California, sponsored by Institute of Transportation and Traffic Engineering & University Extension, International House, University of California, Berkeley, Calif.

Jan. 19-21—National Simulation Conference sponsored by Dallas-Fort Worth Chapter of Institute of Radio Engineers' Group on Electronic Computers, Dallas, Tex.

Jan. 23-25—American Management Association seminar, Palmer House, Chicago.

Jan. 23-25—Helicopter Association of America, Inc., annual convention, Sheraton-Palace Hotel, San Francisco, Calif.

Jan. 23-26—Institute of the Aeronautical Sciences, 24th annual meeting, Sheraton-Astor Hotel, New York, N. Y. Jan. 23—Honors Night Dinner.

Jan. 23-26—Plant Maintenance & Engineering Show and Conference, Convention Hall, Philadelphia.

Feb. 2-3—National Symposium on Microwave Techniques, sponsored by Institute of Radio Engineers' Antenna & Propagation Group and Theory & Techniques Group, Philadelphia.

Feb. 7-9—Society of the Plastics Industry, 11th annual Reinforced Plastics Div., conference, Chalfonte-Haddon Hall, Atlantic City, N. J.

Mar. 19-21—Society of Automotive Engineers, national production meeting and forum, Hotel Statler, Cleveland, Ohio.

Mar. 19-22—Institute of Radio Engineers, national convention, Waldorf-Astoria Hotel & Kingsbridge Armory, New York, N. Y.

Apr. 9-12—Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum and aircraft engineering display, Hotel Statler, New York, N. Y.

Apr. 10-11—Symposium for Management on Applications of Analog Computers, sponsored by Midwest Research Institute, University of Kansas City, Kansas City, Mo.

Apr. 18-19—First Annual National Industrial Research Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology, Hotel Sherman, Chicago.

Apr. 22-26—American Association of Airport Executives, 29th annual convention, Hotel Carter, Cleveland, Ohio.

May 2—Society of Aeronautical Weight Engineers, 14th annual conference, Fort Worth, Tex.

May 6-9—Second National Symposium on Flight Test Instrumentation, sponsored by Instrument Society of America, Bell Aircraft Corp., Convair and Temco Aircraft Corp., Fort Worth, Tex.

May 14-17—First Design Engineering Show, Convention Hall, Philadelphia. Managed by Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

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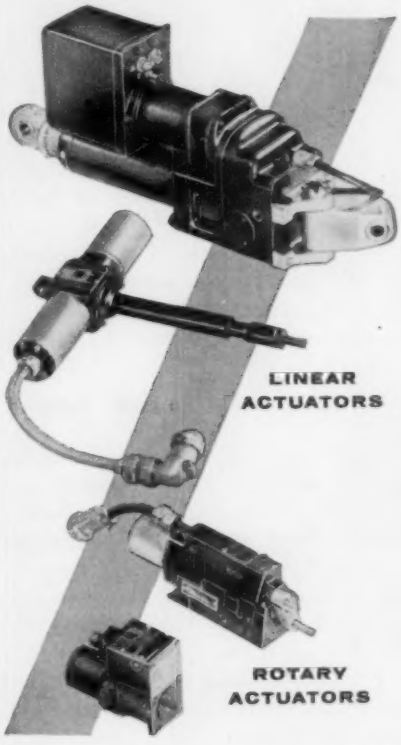

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WHO'S WHERE

In the Front Office

Lt. Gen. Bryant L. Boatner (USAF, ret.), former deputy chief of staff, materiel, joined Eaton Manufacturing Co., Cleveland, Ohio, to counsel and advise in general aircraft affairs.

Dr. Harold V. Gaskill, vice president-planning, Collins Radio Co., Cedar Rapids, Ia., formerly dean of the Division of Science and director of the Industrial Research Institute, Iowa State College.

Maj. Gen. George I. Back, (USA, ret.), assistant to president of International Resistance Co., Philadelphia, Pa., investigating markets for new products and processes. He was formerly chief signal officer.

Leonard S. Kimball, vice president-public relations and advertising, Flying Tiger Line.

Brig. Gen. Leland W. Miller, (USAF, ret.), treasurer and board member, Hewitt & Faust Manufacturing Co., San Diego, Calif., aircraft tooling and sheet metal components firm. Other new board members: **John W. Myers,** also secretary, and **Robert A. Oakes.**

Maj. Gen. Leslie E. Simon, (USA, ret.), director, Research & Development Division, Carborundum Co., Niagara Falls, N. Y., formerly assistant chief, ordnance, research and development, U. S. Army Ordnance Corps.

Honors and Elections

Frank N. Piasecki, president Piasecki Aircraft Corp., has been initiated into Epsilon Chapter, Tau Beta Pi fraternity, New York University.

George W. Jalonick III, executive vice president, Southwest Airmotive Co., Dallas, Tex., has been presented a Wright Brothers medal by Dallas Junior Chamber of Commerce.

Dr. John R. Paulsen, Lake Central Airlines' public relations director, elected to serve on the Local Service Committee of the Airlines Personnel Conference for three years.

Changes

N. Elliot Felt, Jr., operations manager for Project Vanguard earth satellite. He was responsible for design of Glenn L. Martin Co.'s Viking research rocket guidance system.

H. J. (Joe) Chase, works manager, Lockheed Aircraft Service-International, New York International Airport, formerly superintendent of Lockheed Aircraft Service-Overseas jet overhaul project in Japan.

Albert S. Fischer, administrative assistant to director of research and development, Kawneer Co., Niles, Mich.

Russell E. Bowditch, manager of Northrop Aircraft, Inc.'s new sub-contract relations department, Hawthorne, Calif.

Phillip C. Coulter and **Glen R. Solomon,** executive assistants, Military Products Division, International Business Machines Corp., N. Y.

Robert F. Lesley, senior project engineer, Aviation Division, CDC Control Services, Inc., Hatboro, Pa.

INDUSTRY OBSERVER

► General Electric and the Ramo-Wooldridge Corp. are negotiating a novel agreement in which Ramo-Wooldridge will undertake the development of a complex airborne radar and control center system for use in future early-warning picket ships. Under the agreement, Ramo-Wooldridge will get a royalty on all such equipment manufactured by GE's Light Military Electronic Equipment Dept.

► **Wing tanks have been added to the Northrop Snark, long-range cruise missile. Tanks are positioned inboard of the leading-edge extension and are angled with the front of the tank closer to the missile's fuselage than the rear.**

► Russian Arctic expeditions are supported by ship-based single-engined helicopters (Hare in NATO code) and by Consolidated Vultee Catalina flying boats, the latter dating back to Lend-Lease shipments in World War II.

► **British high-altitude research rockets, designed at Royal Aircraft Establishment, Farnborough, will use a slow-burning solid propellant charge. Rockets are 25 ft. long and 17 in. diameter. Instrumentation weight and performance is claimed to equal that of Aerojet's Aerobee. Design altitude of the British rocket is 120 miles.**

► Frank N. Piasecki's new Piasecki Aircraft Corp., is working on number of proposals, has no contracts. The company has submitted a plan to take over Army cargo helicopter training program on contract basis.

► **Development of titanium organic compounds for evaluation as high-temperature hydraulic fluids has been undertaken by New York University as a Navy Bureau of Aeronautics project.**

► New long-range surveillance radar (AN/FPS-8) being installed at New York International Airport for traffic control use by the New York Air Route Traffic Control Center is scheduled to go into operation by mid-January.

► **Civil Aeronautics Administrator Charles J. Lowen is negotiating with Strategic Air Command to get two B-47 Stratojet bombers on loan for testing operational problems facing CAA in jet transport certification and air traffic control of high speed aircraft. CAA currently has little practical experience with jet operations since its own transport fleet consists of obsolete piston-powered planes.**

► Although Boeing is billing its 190,000 lb. gross weight Model 707 as the prototype for its commercial jet transport, the plane being sold the airlines is virtually a new design grossing up to 276,000 lb. in some versions. Since Boeing has not yet finalized design of its commercial model it may not be able to hold its anticipated delivery schedule advantage over the Douglas DC-8.

► **Rolls-Royce is making a determined sales drive to get its Conway turbofan engine into Boeing jet transports sold to foreign airlines. The Conway has passed its type test at 13,000 lb. thrust and is being developed in a more powerful version. Airlines are skeptical over the 13,000 lb. thrust with water injection being promised for the Pratt & Whitney J57 turbojet. Military security still prevents the airlines from getting a clear picture of the J57 and J75 development while Rolls officials can discuss the Conway freely since it has no current military applications in England.**

► Convair has sold six more Metropolitan 440 transports, two each to Lacsa in Costa Rica; Alitalia, Italian air line, and the Australian government for use as VIP transports.

► **Kaman Aircraft Corp., manufacturer of helicopters, has undertaken a new development program for fixed wing aircraft. It is seeking an aerodynamacist with transonic experience.**

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Position_____

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City_____ State_____

Washington Roundup

ATA Opposes Free Riding

Civil Aeronautics Board's proposal of free airline rides for staff members has been rejected by the Air Transport Assn. Individual ATA member carriers have been equally emphatic in their opposition to "free loading" by CAB.

ATA president Stuart G. Tipton informed the Board last week that "the industry finds itself unable to endorse the proposal." He said the industry agreed with the idea and supports the objective of providing an opportunity for members of the Board and for qualified personnel of the Board's staff to become better acquainted with the day-to-day operations and industry problems.

Tipton emphasized, however, that there is total disagreement with the procedures being proposed by CAB. He said the airline industry is extremely apprehensive over any proposal that expands the area within which free or reduce-rate transportation can be provided, particularly on a continuing or permanent basis.

The Board's "free loading" policy was likened to a Pandora's box. Tipton said the airlines feel that "adoption of CAB's proposal would not only throw the door open wider than necessary to carry out the Board's objective, but would almost certainly invite demands for similar privileges from other groups—demands which CAB would find difficult to resist and which, even if resisted by the Board, would be renewed in the Congress."

Profits Investigation

House Armed Services Investigating Subcommittee has completed its study of military aviation procurement policies and profits, but public hearings probably won't start until the second week of January. The study starts with the calendar year 1953. Renegotiation Board has completed its review of contracts up to then.

The tentative plan is to call in airframe manufacturers first, one by one, and then proceed to aircraft engine and parts manufacturers.

Godfrey's Recommendations

One of the weakest contenders for a title as advisor to the Defense Department is Arthur Godfrey, radio and television star, an aviation enthusiast. Defense Secretary Charles E. Wilson considers Godfrey a friend, but he looks with a cold eye on his recommendation that the Air Force be reorganized, then fitted with 1,200 B-52 jet bombers to replace the B-36. The latter, Godfrey said in his memoirs appearing in the Saturday Evening Post, "Should have been patted affectionately on the fanny long ago and retired." Commented Wilson on Godfrey's suggestions: "Good Lord, protect me from my friends. I can look after my enemies myself."

Small Business Hearings

Decline in the share of defense contracts for small businesses from 25.1% in Fiscal 1954 to 21.8% in Fiscal 1955 has triggered hearings, scheduled to start Jan. 5 before the Senate Small Business Subcommittee on Military Procurement, to discover the reasons.

Sen. George Smathers (D.-Fla.), subcommittee chairman, said that although Defense Department has issued numerous policy directives to increase the participation of small business in defense work over the past year, effective implementation of these directives at the operating levels seems to be lacking.

Wilson's Mistake

Defense Secretary Charles E. Wilson not only admits, but declares he once made a mistake in judgment on the atomic-powered airplane. Finding the project promising today because of technological advances, Wilson denies he once called it a "bum airplane." Indeed, he says, "I said worse than that. I said it was a shitepoke. That's a great big bird that flies over the marshes, that doesn't have much body or speed to it, but it can fly." Now, Wilson says, the atomic-powered plane looks better than a shitepoke, the American green heron. Development is being pushed in the Fiscal 1957 budget.

Airpower Positions

Staff study of the world level of armaments, country by country, will be presented to the Senate Disarmament Subcommittee at its first meeting in January. The study is necessarily limited, staff members said, because it is based on public information.

Subcommittee chairman, Sen. Hubert Humphrey (D.-Minn.), points out that the relative military position, particularly with respect to air power, must be known, before disarmament proposals can be considered. Hearings are expected early in the coming session. A by-product of these will be to supply background for other committees evaluating the adequacy of the U. S. defense effort. Membership on the disarmament subcommittee includes former Vice President, Sen. Alben Barkley (D.-Ky.); minority leader, Sen. William Knowland (R.-Calif.); former Armed Services Committee Chairman, Sen. Leverett Saltonstall (R.-Mass.); former Air Force Secretary, Sen. Stuart Symington (D.-Mo.).

Lee Ouster Reasoning

A new reason for the ouster of Fred B. Lee as Civil Aeronautics Administrator is advanced by Rep. Robert Mollohan (D.-W. Va.), Chairman of a House Government Operations Subcommittee.

Lee balked at turning operation of CAA's teletype communications system over to private interests, according to Mollohan, and, instead, supported continued Government operation as "efficient and economical." In response to a request, Lee wrote Mollohan on Oct. 29 pointing out that CAA's economic operation of the system since 1931 was substantiated by studies made in 1942 and in 1952. Mollohan declared:

"Despite these findings, in January, 1955, the Under Secretary of Commerce for Transportation sent representatives of American Telephone and Telegraph Co. to Lee to initiate consideration of a proposal to turn over to private ownership, equipment on three of the four CAA-operated circuits. Meetings were held by CAA with officials of A. T. & T. and Western Union in March. As a result of these meetings, which the Department of Commerce apparently forced upon CAA officials, the CAA has been actively working on the required specifications to accompany the advertisement for bids.

"It is not unreasonable to conclude that Mr. Lee's ouster was dictated in part by his position on the sale of the CAA teletypewriter system at the expense of the American taxpayer."

—Washington staff

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Defense Seeks $2 Billion Budget Jump

Bulk of new money for USAF and guided missiles; Wilson sees 3 stable years for aircraft industry.

Washington—Defense Department will ask Congress for new appropriations of $35 billion in Fiscal 1957, an increase of $2 billion from its appropriation in Fiscal 1956. Bulk of the increase will go to the Air Force and guided missile programs.

Spending for the year will reach $35.5 billion, Secretary Charles E. Wilson estimated. This is $1 billion more than the current rate.

For the aircraft industry, Wilson said last week, there is no prospect of a change in the pace of defense business for at least the next three years. He said his department is "trying to get a fairly firm three-year program" on aircraft procurement, contingent on Presidential approval and appropriations by Congress.

$1 Billion Missile Program

Secretary Wilson added that he has "plans" to map a three-year outlook for the industry and "we are going to try to do more along that line than we have been doing."

The Fiscal 1957 guided missile program will hit $1 billion for the first time. The decision, Wilson said, can be attributed to technological advances more than it can to the threat of Soviet competition.

He made a noticeable effort to discount hopes of fast development of the intercontinental ballistic missile, indicating that it still is five years away. On the other hand, he said the shift from conventional weapons is under way, indicating that such projects as the Boeing Bomarc, North American Navaho and Northrop Snark are promising for a payoff in the immediate future.

"There is a whole range of things in that area that we have been spending money on for a number of years," Wilson said, "and that is why I say there is an overemphasis on the ballistic missile currently." He added that the ICBM, in his opinion, is another "mysterious sort of thing."

This comment was widely interpreted as a sign that there is no truth in reports that the ICBM has been put on a "crash" basis putting the project, timewise, in a class with the wartime Manhattan Project that produced the atomic bomb.

On the other hand, Defense Department officials who have been pressing for increased research and development efforts will get some satisfaction out of the Fiscal 1957 figures when they are revealed in detail.

Atomic Engine First

With particular reference to the atomic-powered airplane, Wilson said:

"We are spending money rather generously, even extravagantly, on the development of any new thing that shows promise. We are spending money to overcome bottlenecks or (achieve) breakthroughs in the engineering and scientific business before wasting money on some kind of a big unit."

Regarding atomic-powered aircraft development, Wilson indicated the project is being pushed first for achievement of the engine. He said the airframe will come later, although it already has been announced that Convair and the Glenn L. Martin Co. are working on nuclear aircraft studies.

On these and other projects, Wilson said, there will be more spent "out ahead, rather than spending the money building up a big increase of . . . conventional weapons."

In reviewing the new budget that will be sent to Congress next month, Wilson made these other points of interest to the aircraft industry:

Wilson's Invitation

Washington—Secretary of Defense Charles E. Wilson agrees with Rep. Carl Vinson that more competitive bidding and less negotiation (see p. 14) would be a good way to purchase military equipment. But he also has a suggestion on how the congressman can help.

Says Wilson:

"If we could buy everything through competitive bidding I would be in favor of doing it. I personally know no way of doing that and I have been on both sides of the business.

"If anyone knows how to do it I would like to invite him to come over and try to tell me how it could be put in effect."

Wright Memorial Dinner Awards

Trophy winners at the Wright Memorial Dinner in Washington are shown above after the presentations by Vice President Richard M. Nixon. They are (l. to r.): Thomas Lanphier, Jr., president of the National Aeronautic Association; Hugh L. Dryden, director of the National Advisory Committee for Aeronautics and winner of the Wright award; Richard Travis Whitcomb, research scientist for the National Advisory Committee for Aeronautics and winner of the Collier Award for his area-rule design concept; Vice President Nixon, and Willis Brown, Brewer Award winner and education specialist.

• **Bulk of the $1 billion** increase in spending will go to meet increased costs, rather than additional hardware.

• **Many of the savings** effected in recent months to help in the Republican effort to balance the budget are "one-shot savings." This means "we are getting closer to where the appropriations are going to have to be substantially in line with estimated expenditures so that we can keep the thing going."

• **There is no chance** that USAF will boost its immediate goal to achieve 137-wing strength by the end of Fiscal 1957. Its capacity is being improved by better weapons and such features as air-to-air refueling.

• **Expenditures for military public works** will continue within 5% of the present rate.

• **U. S. does not "really know"** whether we are ahead or behind the Russians in the development of an ICBM.

• **Increase of $600 million** in requested USAF funds is due in large part to continued buildup toward 137 wings, continued expense for the Distant Early Warning radar line and Air Force missile projects.

• **Navy will request money** to start work on an atomic-powered surface ship that will carry missiles.

There is strong evidence that Wilson is trying to avoid a showdown between branches of the armed forces that are in disagreement over missions and control of the new weapons about to enter America's arsenal. Already the Army and Air Force have been in a dispute over the former's fast-growing air arm and the Navy is known to have strong feeling about its role in an atomic war.

Evidences of this have been more common in recent weeks and when they appear the conclusion is inevitable that the budget discussions will provide a final forum where they will be settled by Congress.

Wilson, acting on the basis of these predictions and advances in the missile field, reshuffled responsibilities to speed the missile program. His comment:

"I made a commitment to all the services that the development of the missile, and the success or failure . . . of any particular missile would not in any way prejudice the roles and missions of the services as might later be agreed upon.

"In other words, I didn't want to argue about roles and missions for paper missiles. I thought we could put that off a while.

"There are some assumed requirements of the Navy for missiles and potentially maybe the Army . . . may need them. How we will set up to plan our military matters after the missiles actually exist, I thought could be handled more intelligently after their development." He added: "That got rid of one of the arguments about the business."

1956 Industry Sales Will Exceed $8 Billion for 4th Year, AIA Says

By G. J. McAllister

Washington—Sales in the aircraft industry during 1956 will exceed $8-billion for the fourth consecutive year, Aircraft Industries Assn. forecasted this week in a year end review.

During 1955, the sales volume of aircraft, aircraft engines, propellers and spares was $8.4 billion, approximately $400 million more than AIA predicted for the year. Sales of the twelve largest airframe manufacturers in 1955 was the largest since World War II. They reported sales of $4,940,000,000 compared with 1954 sales of $4,920,000,000.

Profit level of the industry is expected to increase in 1956. Profits for the 12 largest airframe companies amounted to $182 million in 1954 and will be higher in 1955. However, the bulk of aircraft profits are subject to the Renegotiation Act, and recent actions by the Board regarding 1952 profits have caused uneasiness in the industry.

Stable Outlook Ahead

Boeing Airplane Co. has been ordered to refund approximately $10 million from 1952 profits (AW Nov. 7, p. 12). If the Board continues to follow its stiff policy in computing redeterminations the industry can expect refund orders on profits earned since 1953. The Board has not yet ruled on industry profits earned since 1952.

The dominating characteristic of the aircraft industry is its stability in the past years, and the outlook for future years, based on national defense policy, is that the industry will remain stable.

Stability of the industry has contributed to economy and efficiency in the production effort. In contrast to the period following the Korean war, when the industry was plagued with material shortages and facility expansions, there is now increasing emphasis on manufacturing methods and cost reduction efforts.

Jet Transports Sold

Accelerated efforts in the field of research and development also point to future gains when the benefits are realized. Research and development progress has been made in the fields of hypersonic intercontinental ballistics missiles, atomic powered aircraft, supersonic bombers and satellite vehicles.

Keeping pace with progress in the military field, the commercial field registered significant gains. Orders were placed for more than $1 billion worth of jet transports. Transport manufacturers backlogs are at an all-time high.

At the end of September, unfilled orders amounted to $13.9 billion, a billion less than the backlog at the end of 1954. The $13.9 billion backlog breaks down into $11.1 billion for military orders and $2.8 billion for civil orders at the end of 1954.

Aircraft Deliveries Down

Part of the decline in the backlog is due to the delay in placing orders for new military aircraft during the year. Total obligations by the Air Force and Navy since the start of Fiscal 1956 on July 1 amounted to only $64 million (AW Dec. 19, p. 18). Expenditures during the same period reached $2.5 billion. Defense Department at the end of October 1955, had an unobligated balance for aircraft and related procurement amounting to more than $14.8 billion, compared with $8.9 billion at the end of 1954.

Production of military aircraft in 1956 is estimated as slightly less than 8,000 units. This is about 500 less than the deliveries of aircraft made during 1955. This is offset, however, by the increased deliveries of guided missiles. The trend in lower rate of aircraft deliveries started in 1954.

However, measured by the more accurate yardstick of airframe weight, aircraft deliveries did not decline as sharply as the unit figures indicated since aircraft today are larger and heavier.

Civil aircraft deliveries during 1955 reached 4,500 units, a gain of a thousand over 1954. Largest part of the increase was in the utility aircraft field where deliveries are estimated at 4,250 units compared with 3,071 units in 1954. The dollar volume increased substantially. Utility aircraft sales are estimated at about $75 million in 1955 compared with only $43 million in 1954.

This is due to the fact that sales of larger and heavier planes, mostly twin-engine types, more than doubled over 1954.

750,000 on Payrolls

Commercial aircraft deliveries declined slightly. They were down from 291 units in 1954 to 280 in 1955. Activity in commercial air transport firms moved forward at a rapid pace near the end of the year as new types of turbojet transports got under way. Because of the long lead time required

for new transport aircraft, deliveries of jet transports will not start until 1958. Completion of unfilled orders for piston-engine aircraft will keep production at a high level until deliveries of turbojet and turboprop transports are started.

The aircraft industry ended the year as the nation's second largest employer, ranking immediately behind the automobile industry. Employment was stable during the year with an average of 750,000 persons being employed monthly in the aircraft industry. Total wages in 1955 will exceed $4.1 billion. This does not include employes of large subcontractors and suppliers. Inclusion of these workers would have put the aircraft employment over the 1 million mark. The automobile industry employed 910,000 persons during 1955. Hourly wages increased from $2.08 in 1954 to $2.19 in September 1955.

Outlook is that wages will continue to gain.

Aircraft industry is the nation's largest employer of engineers and scientists. One out of every 11 workers in the industry is engaged in engineering activities compared with a 1 to 25 ratio in World War II.

Other AIA predictions:

- **Additional wings of high speed,** heavy jet bombers will be added.
- **Substantial deliveries** of the "century series" of supersonic fighters will be made and the Navy and Marines will receive supersonic fighters.
- **More powerful jet engines** will be delivered in quantity.

More Bid Contracts Demanded

Washington—House Armed Services Investigating Subcommittee has demanded a reduction in military procurement by negotiation, notably in the Air Force, and establishment of advertised bid contracting as the rule instead of the exception.

Protesting that "in the case of the Air Force, negotiation has practically taken over the procurement system," a report by the subcommittee, headed by Rep. Edward Hebert (D.-La.), disclosed these figures:

- **During a 30-month period** from Jan. 1, 1953, to June 30, 1955, 99.56%, or more than $18.7 billion, of the dollar-volume of USAF procurement was negotiated, compared with only .44%, or $83 million, in advertised bid contracts.
- **During this same period,** 80.8% of Army and 94% of Navy contracts were negotiated.
- **Total Defense Department** procurement outlay of $36.4 billion for the period was divided: $34.3 billion or 94.2% negotiated; $2.1 billion or 5.8% advertised bid.

The subcommittee's basic criticism is that the military services have continued to use the national emergency declared by former President Truman in mid-1950 to justify negotiations.

The 1947 Armed Services Procurement Act declared competitive bid contracting as the standard policy, but lists 17 exceptions under which negotiation is permissible. One of these is contracts "determined to be necessary . . . during the period of a national emergency declared by the President or by the Congress."

The subcommittee added, "The conclusion seems inescapable that the departments have by a consistent, progressive increase in the use of (this) exception in the Armed Services Procurement Act practically scrapped the traditional system of free advertised bidding." USAF procurement instructions, it said, "is the most shocking . . ."

"If the public is to have some assurance that defense costs are to be critically examined, the Government had better return to competitive advertising on a large scale and allow American producers and labor, in free and open competition, determine the true cost of national defense competitively as a matter of national policy, instead of transferring that responsibility to the secret files of a negotiator," the subcommittee said.

Endorsing the subcommittee's report, Armed Services Committee's chairman, Rep. Carl Vinson (D.-Ga.), announced that he would push for "some first-class overhauling of procurement law to restore more competition."

SAS Buys DC-8s

Scandinavian Airlines System last week announced it had placed a $50 million order for seven DC-8 jet transports with an option on three more. First delivery is scheduled for January, 1960. SAS, second foreign airline to order the Douglas jets, will place the DC-8s on its New York-Scandinavia and trans-polar routes. The airliners, according to Scandinavian President Tore H. Milert, will cut nine hours off the present New York to Copenhagen runs, flying the route in seven hr. 10 min. The jetliners will cover the 5,800-mile trans-polar route between Los Angeles and Copenhagen in 11 hr., 18 min. as opposed to the present 22½ hr. SAS has not yet decided on the engine but is considering P&W's J57 and J75 and the Convair by-pass.

First foreign carrier to order DC-8s was KLM Royal Dutch Airlines (AW Nov. 21, p. 1$5).

Burke Says Russians Seek to Control Sea

Washington—Nuclear power, nuclear warheads, guided missiles and supersonic aircraft make naval strength more important to free nations than ever before in history, Adm. Arleigh Burke, Chief of Naval Operations believes.

Russia realizes this, Adm. Burke said, and has become the second-ranking sea power in the world, and still is growing fast. He pointed out that the Soviet Union has 400 submarines; Germany started World War II with 57.

"The Soviet Union realizes that control of the seas is absolutely essential to success in war," Adm. Burke said. "That is why the Soviet Union is expending so much of her national effort to build a navy—a navy which is designed to prevent the United States and the free world from using the seas near the Eurasian continent.

"That is why she is laying so much stress on Naval aviation. Only recently we learned from Red Star that the Soviets were publicizing the operations of their aircraft and their submarines.

"That is why the Soviet Navy is emphasizing the development of mines—and the medium bombers to carry them. That is why she is developing guided missiles so she can destroy our overseas ports, our overseas bases, our supply dumps overseas and our ships that attempt to reach overseas ports."

To meet this threat, Adm. Burke said, our Navy is pushing nuclear propulsion and "nuclear-powered submarines of the near future will be capable not only of making high-speed atomic torpedo attacks on enemy convoys but they will be capable of killing enemy submarines, of providing early warning from enemy threats approaching by air and sea.

"They will be capable of fueling and supporting seaplanes, of landing Marines on hostile shores, of launching guided missiles against targets at sea and on the enemy's homeland. All of them will have two or more capabilities. All will be multi-purpose."

The Navy Chief of Operations said he does not believe Russia is building an aircraft carrier, as recently reported in the press. He said the Red emphasis is on undersea warfare to combat surface vessels of the free world and that they have little or no use for an aircraft carrier.

Adm. Burke, a key figure in the 1949 Navy fight against USAF plans to buy the B-36 bomber, also was asked how the United States could carry out its massive retaliation policy today if the huge Convair plane contract had been cancelled. His reply was that USAF probably would have stepped up the B-47 and B-52 programs.

Industry Faces Army Aviation Challenge

By Claude Witze

Ft. Rucker, Ala.—The American aircraft industry has been challenged to develop and produce a new family of "aerial fighting vehicles."

Brig. Gen. Carl I. Hutton, commander of the Army Aviation Center here, says the Army of the future will be airborne, but not another Air Force. He gives the aircraft industry at least 10, but not more than 20 years to make this possible by meeting the "urgent need for increased mobility."

Fully cognizant of the present state of the art, Gen. Hutton says the Army needs these "aerial fighting vehicles:"

- **A finding vehicle.** This will be a reconnaissance airplane, much faster than the present L-19 but not duplicating USAF reconnaissance equipment used for long-range missions.
- **A fixing vehicle.** This will be used to hold an enemy in position, much as artillery fire is used to nail him down for the kill. Sometimes the finding vehicle, like the artillery, will perform the kill.
- **A destroying vehicle.** This will be a heavy fighting unit, comparable to a tank in its armor and firepower.

All of these new "aerial fighting vehicles" must be armored.

The aircraft industry must do this job for the Army because the very existence of our ground forces may depend, paradoxically, on their ability to get off the ground. It has been demonstrated, most recently in Exercise Sagebrush, that atomic weapons can make earthly human habitation and mobility impossible.

Basic Differences

Gen. Hutton is a forceful spokesman for Army aviation. "Obviously," he says, "we do not have any aircraft within the Army capable of inducing revolutionary tactical changes. What is needed is a new statement of our military requirements upon which the inventive skill of industry can work. This type of thinking is extremely difficult since our minds are constricted by the framework of existing aircraft types."

Here Gen. Hutton and other Army aviation enthusiasts part company with tradition-bound officers of the ground forces. His approach and the demand on industry to develop a new vehicle leaves the inescapable conclusion that the conflict with the Air Force is between USAF and more conservative Army interests.

The latter have not recovered from the fact that they once had wings, since severed from their organization and put under the Air Force. Gen. Hutton and other spokesmen for the Army Aviation Center profess no regrets over this change. They do demand the right to let Army mobility catch up with modern firepower. Vital to this, they say, is the "aerial fighting vehicle."

Brig. Gen. Carl I. Hutton, 49, graduated from West Point in 1930, learned to fly 16 years later after serving as an artillery and quartermaster officer. A veteran of the African and Normandy invasions as well as the Korean war, he was appointed commandant of the Army Aviation School at Ft. Sill, Okla., in 1954 and later that year took command of Ft. Rucker, home of the new Army Aviation Center.

Gen. Hutton defines the issue:

"Heretofore the Army has tended to consider aircraft as a means of transporting the soldier to battle. There has been comparatively little development in the area of using aircraft as fighting vehicles.

"The distinction between the two is fundamental. An airplane as a piece of transportation would logically belong to a transportation corps. An airplane as a fighting vehicle would logically belong to the tactical unit of which it is a part. In one case we would have an air transported Army, and in the other case we would have an air fighting Army."

Proof in Sagebrush

The concept, in Gen. Hutton's opinion, had its origins in Korea. There, he says, the Army won scars "because the GI was abandoned by our inability to use our technology to help him. The soldier was still dug in because firepower outmatched mobility."

With atomic shells, the situation is worse instead of better. The possibility of movement is gone. Gen. Hutton says:

"Man still walks at about 1½ mph. across country, and track-laying vehicles have about the same speed which they had in World War II. The 60 mph. tank has not been a decisive factor because the places on the earth's surface where such speed across country is possible are extremely rare."

Exercise Sagebrush offered definite proof of this point. The Louisiana maneuvers, where 110,000 troops and more than 2,000 vehicles tore up and down the Louisiana swamps for six weeks, would have been a hopeless debacle if the atomic weapons had been real, not simulated.

It was clear that atomic weapons can cripple ground troops as well as their supporting Air Force. If the men are not killed their armored vehicles would be bogged down on impassable terrain. What roadblocks were not provided by nature would be put there by the enemy.

While the most conservative Army officers accept mobility and dispersion as the best defense against atomic attack, they did not prove their case in Louisiana.

Limited roads running in one direction, lack of adequate crossroads and swampy terrain made it clear that the Army could be stopped.

Independence of Terrain

It was equally clear that we have no aircraft capable of contending with the situation, flown by the Army or the Air Force.

More power is essential, Gen. Hutton said. This the aircraft industry must find to let the Army trade speed and firepower for heavy armor and use the "aerial fighting vehicle."

It is needed, he said, by every fighting branch of the Army—the Trans-

Army Pilot Training

Ft. Rucker, Ala.—Army's Aviation Center here is the home of the Army Aviation School, with a staff and faculty of 900, where pilots learn how to use light planes and helicopters the Army way.

Courses are given in tactics, instrument flying, twin engine transition, helicopter tactics and cargo helicopter operation.

There are 754 students. Most distinguished recent graduate: Brig. Gen. Hamilton H. Howze, chief of the Army Aviation Division in the Pentagon. The second general Army officer to get his wings, Gen. Howze is a senior aviator.

portation Corps, Artillery, Infantry, Armor, Engineers and Signal Corps. All need "freedom to move independently of the terrain," he said.

Gen. Hutton added: "Really great increases in mobility do not appear possible as long as the fighting vehicle has to move through mountainous terrain, swamps, jungles, rice paddies and rivers. On the other hand, fighting vehicles which can move through the air are not impeded by accidents or terrain.

"The pace of the soldier across the earth may be increased a hundredfold, or two or three hundredfold, if he can move in the air above all obstacles."

No Existing Types

Here Gen. Hutton calls on the aircraft industry:

"If this method of looking at recent military history is valid, we should begin immediate experiments to determine the extent that air fighting mobility will balance atomic firepower."

Gen. Hutton reiterated to AVIATION WEEK that he is at no point talking about existing aircraft.

"Nobody," he said, "is very sure what industry could produce if we told them what we need on the battlefield. It will take 10, maybe 20 years, to develop this equipment.

"It must be pointed out that no existing types of aircraft appear to be suitable for the Army's use as fighting vehicles.

"Scientific knowledge, however, has been moving at such a rapid pace that either an aircraft or a family of aircraft in which the Army could fight may be possible."

Best bet in 1955, Gen. Hutton said, is the STOL (Short takeoff and landing) aircraft (AW Dec. 19, p. 28). But this still is far from the ultimate answer.

Power Unit Key

As in the case of every aeronautical advance from the Wright brothers to jet propulsion, the answer lies in improved power units. Industry experts say they could build reconnaissance aircraft, aerial tanks and personnel carriers that would meet Army requirements.

The trouble is that meeting the short takeoff and armor requirements will leave no lifting capacity to carry soldiers.

Consistent with the history of aeronautical advances, the search is on for a power unit that will make the Army's "aerial fighting vehicle" a reality. Most promising, industry observers say, are nuclear propulsion and rocket engines. The latter are most advanced, provide maximum energy in a minimum-sized package, but range is limited.

Gen. Hutton is encouraged by other recent developments, such as the Lockheed and Convair VTO experiments, the Hiller flying platform, the vertically-rising airplanes that utilize boundary layer control and other aeronautical advances.

He is optimistic about the future. "Such developments, in addition to what has gone before in the way of fixed wing and helicopter knowledge," he said, "make it appear that the field of aerodynamic technological growth now offers the possibility of a vastly increased number of combinations.

"In the jargon of the industry, the state of the art is developed to the point where a technological breakthrough may be possible."

Projects Under Way

The aircraft industry is not blind to the Army's challenge and work is going forward in the research offices of both rotary and fixed-wing manufacturers. In addition to projects under way for the Air Force and the Office of Naval Research, there is a large number of privately-financed programs.

These are being pursued by Fairchild, Stroukoff, Weber Aircraft Corp. (AW Oct. 24, p. 38) and others. Charles Zimmerman of National Advisory Committee for Aeronautics is contributing to the developments.

On one point Gen. Hutton is vehement. The USAF-Army 1952 Memorandum of Understanding, he said, deprives the Army of freedom it needs to sponsor development of "aerial fighting vehicles." The 5,000 lb. limit on Army aircraft will have to go, he says, and the entire paper rewritten to lift restrictions now impeding the Army's program.

Gen. Hutton would make a distinction between interdiction and close support, giving the former function to the Air Force.

Close support, he says, "is an integral part of the ground battle, and it must be completely responsive to the will of the commander."

"Confusion and bickering have marked attempts to make the present

New Helmet by ARDC

MA-1 helmet and altitude suit are new items of personal flight equipment developed by Air Research and Development Command. Oxygen mask and mike have been removed from molded plastic facepiece of earlier helmets and attached to base of MA-1 front frame. New transparent visor is much wider, permits a broader range of lateral and downward vision. Visor is demisted by inset heating elements.

system work. A revision of the functions to confirm the Air Force's dominance in the interdiction role and to establish the Army's dominance in the close support role would end the confusion and bickering."

All this, in the opinion of competent industry and military observers, is preliminary to a rewriting of the 1952 memorandum and the real forum where the issue will be thrashed out is Congress.

Before that forum the Army will determine its own future. If its case is handled with skill by well-tutored officers who can make clear the distinction between airplanes and "fighting vehicles" they will win support in the Fiscal 1957 budget.

New Reconnaissance System Announced

A new super-sensitive night-time aerial reconnaissance system, reportedly capable of providing a clear, sharp picture of ground activities "under the poorest lighting conditions at night," has been developed by USAF's Wright Air Development Center.

The system, called "cat eye," resembles a closed-circuit TV, employing both a television type camera and a cathode ray tube viewing screen. However, it is reportedly 1,000 times more sensitive than a conventional type television camera.

The basis of the system is an "optical amplifier," which provides a major increase in contrast ratio between varying shades of gray and black.

Flight tests on an experimental system, a Wright spokesman said, showed that "airborne observers were able to see the ground clearly on a moonless, winter night." Westinghouse Electric Corp. and the Radio Corp. of America presently are developing improved models of the optical amplifier. ARDC says the device is expected to become an invaluable aid for night-time aerial reconnaissance.

A photoelectric cell is used to convert the available light into electrons, which in turn are accelerated and used to produce electrostatic charges on an intermediate screen or plate. Here the signals are amplified, to increase the contrast ratio between varying shades of gray, and then sensed by an electron beam which is amplified to produce a signal which is displayed on a cathode ray tube.

(The process appears to be an adaptation of storage-type cathode ray techniques which RCA and others have developed for other uses.)

The original WADC development was carried out by the Physics Branch of the Aeronautical Research Laboratory.

Largest Helicopter Makes Record Lift

JET POWERED XH-17 developed by the Aircraft Division of Hughes Tool Co. gets ready above to airlift a USAF trailer van, largest object ever to be carried by a helicopter. Truck pushes the van into position between the XH-17's stilt-like legs . . .

. . . AND THE WORLD'S LARGEST HELICOPTER picks up its record load and flys away. Hughes officials say helicopters of the same design could carry 10-ton loads, including tanks.

Boeing Reveals Noise Suppressor; Port Authority Stresses Urgency

By Henry Lefer

New York—Boeing Airplane Co. last week announced that the "basic problems of jet engine thrust reversing and sound suppressing have been overcome" through its newly-developed reverser-suppressor. However, the New York Port Authority—whose ban against jet transports has given impetus to the demand for finding an effective solution to the noise problem—remains skeptical.

While conceding that Boeing's suppressor may be a step in the right direction, Port Authority officials believe there is still a long design and development road ahead.

The authority is caught in the middle of perhaps the most difficult noise controversy in the country. Its four airports—Newark, LaGuardia, Idlewild and Teterboro—handle about 2,000 landings and takeoffs on an average day. On a peak day, LaGuardia alone may handle 1,000 movements—an average of about one every 45 seconds and actually a much higher rate during rush periods.

In the Middle

On the authority's one hand are the hundreds of millions of dollars committed to the purchase of jet transports and the push of progress in aviation development.

On the other is local opposition to the noise and possible dangers of the heavy air traffic, which has crystallized in the form of local pressure groups, such as the one in the Newark-Elizabeth, N. J., area and in local ordinances banning low flying, such as that passed by Cedarhurst, L. I., N. Y. The Cedarhurst ban was upset by the Eastern District Federal Court, but it is being appealed.

Latest, and perhaps most dangerous, move to the carriers serving the New York area, is a bill being prepared for the hopper at New York State's upcoming legislative session. This bill would ban jet transports from New York airports for the next 10 years.

The Port of New York Authority is an autonomous organization set up by the states of New York and New Jersey. Nevertheless, it is subject to the control of the governors of the two states, who can exercise an item-by-item veto of the minutes of the authority's meetings, thereby tying its hands if it is not responsive to their demands.

The governors of the two states, being elected officials, are naturally responsive to the demands of voters.

Relocation of the New York airports is out of the question, the Port Authority says. Suitable land is not available. Furthermore, the investment in ground facilities far exceeds that in aircraft, and if any change is made, it should be made in the planes, officials of the authority contend.

As an example, by October there was more than $24 billion invested in the 532 airports used by the nation's scheduled carriers. The capital investment of the airlines in equipment was about $1 billion. Approximately the same ratio has been maintained in expenditures since then.

The geographical, as well as financial aspect, also will limit extension of runways at most airports. Therefore, Port of New York Authority spokesmen say, it is the responsibility of the industry itself to give the new jets the capability of operating on today's runways and quiet enough to still the public outcry which is sure to be raised against their noise.

The jet noise problem was, for some time, shunned by almost everyone. The makers said, "Let the airlines worry about it." The airlines tended to buck the problem to the airports. And the airport operators had to face the angry public. However, all those connected with the problem now appear to have a lively understanding of the situation, probably sparked by such moves as the Port Authority's flat ban on jet operation at New York civil airports.

Boeing's Suppressor

Both Douglas and Boeing are hard at work on the design of suitable noise suppressors and thrust reversers, of which the new Boeing development is the latest to be disclosed. It is understood that this project is receiving top priority at Boeing. United Aircraft, whose Pratt & Whitney Aircraft Division makes the J57s and J75s slated for the new jet transports, also is pushing hard for a solution, as is the National Advisory Committee for Aeronautics.

Boeing's reverser-suppressor is said to cause no appreciable reduction in the total available engine thrust. It has been subjected to full-scale tests on the 707 jet prototype. The Port Authority, however, maintains a "show-me" attitude and is waiting to see a set of suppressors flying on a jet transport.

All the airline purchasers of new jet equipment have stipulations concerning noise in their contracts, but the stipulations are generally vague, requiring the manufacturers to keep noise at a "reasonable level." What this "reasonable level" is, no one seems prepared to say. The subject of what type, intensity, pitch, etc., of noise is annoying or harmful still requires considerable study. The consensus seems to be that if the jets will be no noisier than today's DC-7s and Super Constellations, the industry may get by. However, with the expected growth of air transport and the already-powerful opposition to the situation as it is today, the Port Authority is not convinced that this noise level will be acceptable.

A meeting to investigate jet problems will be held in Washington next week (Jan. 10-12), bringing together representatives of the airframe industry, the Civil Aeronautics Administration, the Airport Operators Council and the Air Transport Assn. The Authority hopes that this meeting will start work on a series of noise standards to be applied to jet operations.

In the meantime, the Port Authority stands by its 1951 ban which has prevented the Comet and 707 from landing in New York.

THRUST REVERSER-NOISE SUPPRESSOR produced by Boeing is, the Port of New York Authority believes, the first step in the right direction. Pictured above is an experimental reverser which has been taxi-tested on the 707 prototype at 98 mph.

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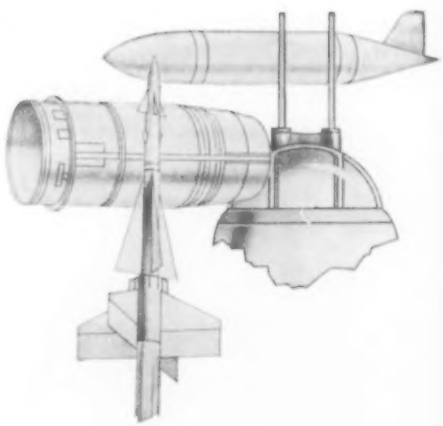

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BLASTED OUT into supersonic airstream, seat and dummy rock forward, backward, spin sideways and tumble wildly.

Rocking, Not Tumbling, Is Bailout Hazard

Pilot injuries during a high-speed bailout are now believed to result from a violent series of rocking and yawing motions, rather than from complete revolutions in tumbling. These wild motions cause hemorrhages from blood pooling and broken arms and legs from flailing limbs.

This new contribution to the solution of ejection problems has been made by North American Aviation engineers, experimenting to duplicate the escape of NAA pilot George Smith from an F-100 Super Sabre (AW Nov. 14, p. 14).

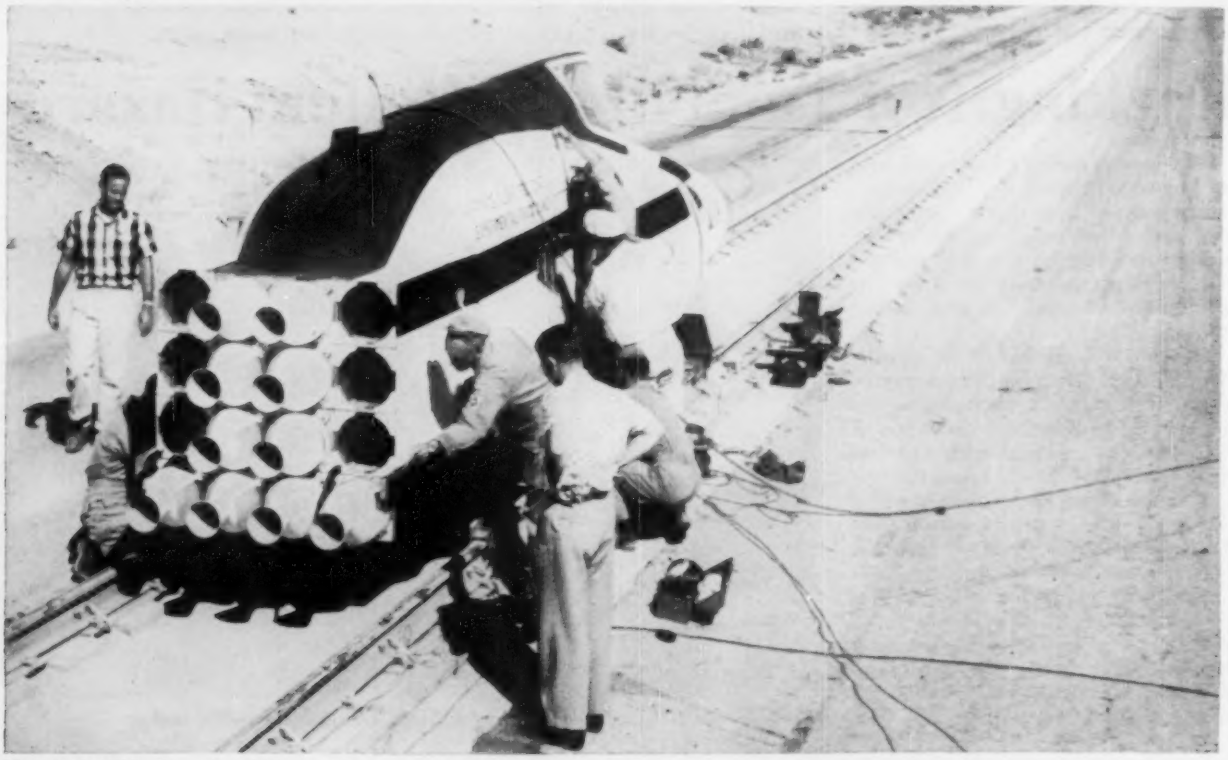
A series of test runs was made at Edwards AFB, Calif., approximating the same forces that battered Smith at 777 mph. and 6,500 ft. altitude.

An anthropomorphic dummy was formed and dressed to duplicate Smith as he was on the day of the accident. Accelerometers inside the head and torso telemetered G loads in horizontal, vertical and lateral directions.

DEAD DUMMY is examined after ejection test simulating supersonic bailout.

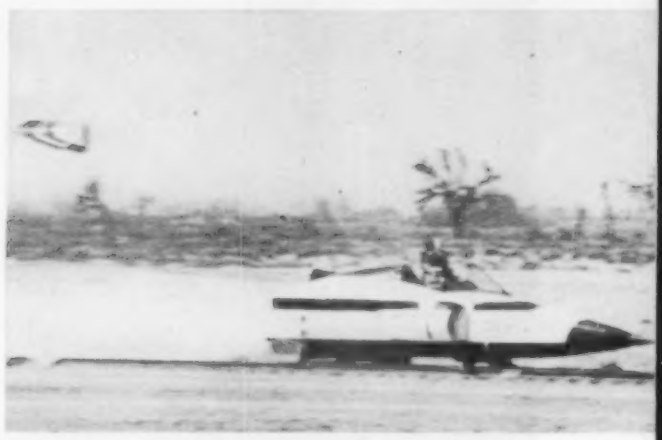
CONVAIR F-102A escape system is checked out before highspeed test of dummy pilot ejection and seat separation.

Dummy Tests on Sled Mockup of Convair's F-102A Give Researchers



TEN ROCKETS drive the sled for these runs on the highspeed track at Edwards AFB; as many as sixteen may be used.

CANOPY RIPS OFF at start of ejection sequence and . . .



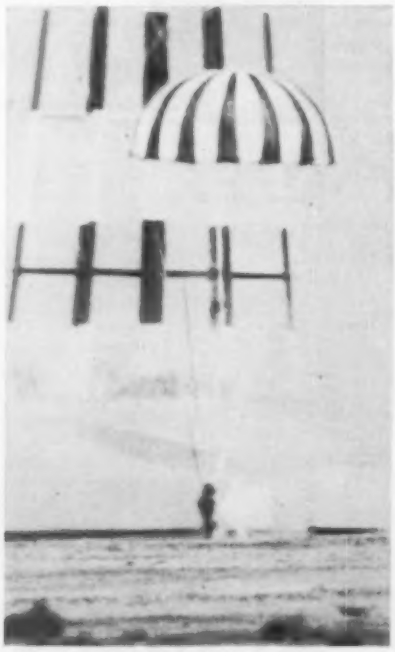
DUMMY PILOT and seat start rising out of cockpit.

FORWARD ROTATION begins as height increases and . . .

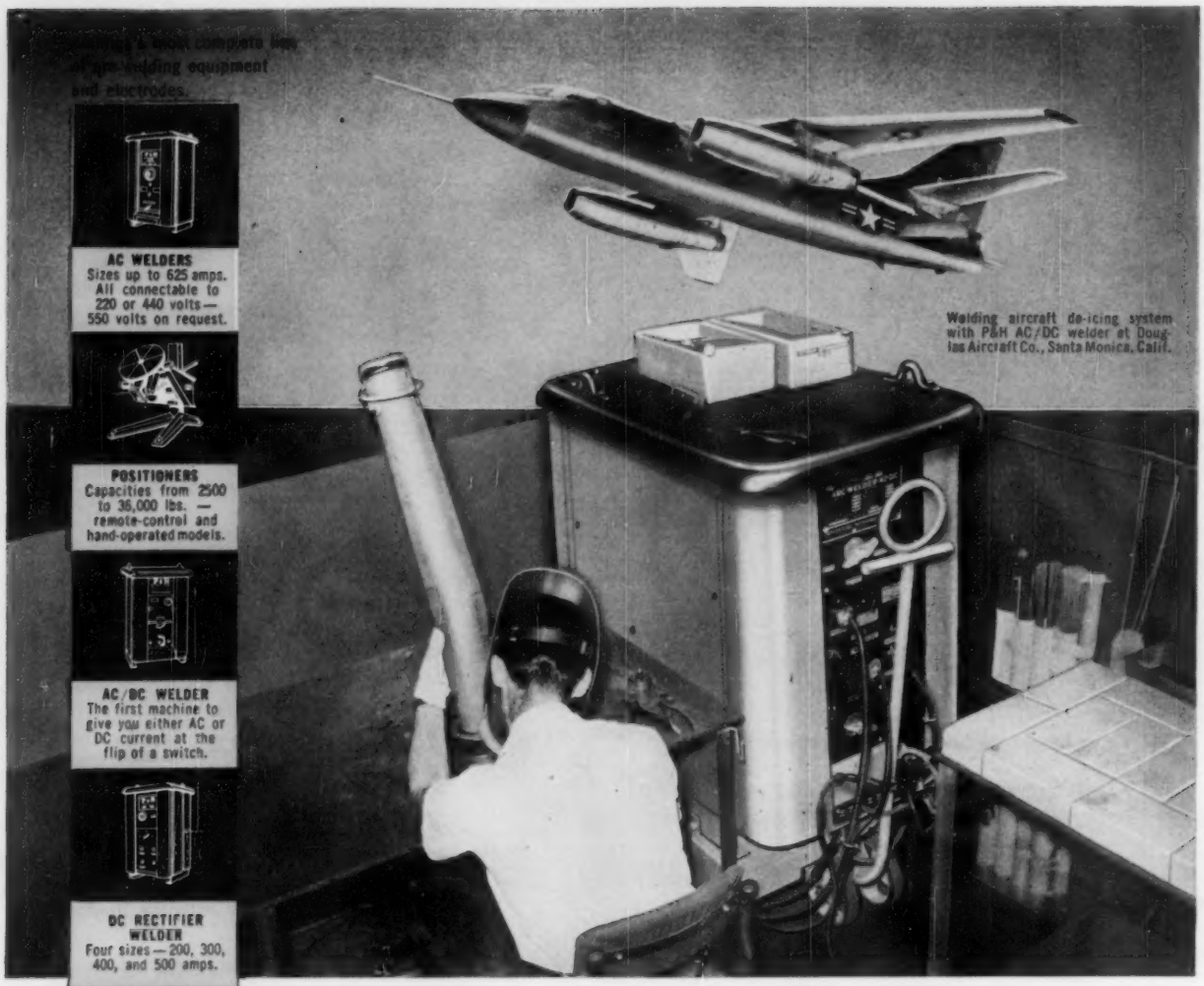
BUILDS UP, reinforced by the battering slipstream.

New Design Data for Advanced Supersonic Ejection System

SEAT SEPARATION and parachute deployment are automatic and . . .



DUMMY LANDS under fully open canopy.



Welding aircraft de-icing system with P&H AC/DC welder at Douglas Aircraft Co., Santa Monica, Calif.

AC WELDERS
Sizes up to 625 amps. All connectable to 220 or 440 volts—550 volts on request.

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Capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models.

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New P&H AC/DC Welder does work of two machines for Douglas Aircraft

. . . saves time, cuts welding costs, provides new convenience

The very high temperatures and pressures encountered in jet aircraft de-icing systems posed some new problems for Douglas Aircraft. Instead of aluminum throughout, it was necessary to combine the thinnest gauges of stainless steel and titanium alloy ducts with aluminum sections.

Since AC is required for joining aluminum, and DC for making good welds on titanium and stainless alloys, two separate machines were formerly required at each station. But that was before P&H combination AC/DC machines entered the picture. Here's what a company report says:

"The development of this combination machine has provided better quality, greater convenience, and . the same time lowered our costs for equipment and labor."

Douglas finds that their weldors save minutes per part with these machines—they change from AC to DC and back with the turn of a switch. They have less spoilage and less fatigue. And P&H Dial-lectric control provides instant heat selection and an easy, quick-starting arc.

And you can save money with these versatile AC/DC machines, too. See your nearby P&H representative or distributor or write Welding Division, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

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MARTIN PBM MARINER (above) goes through tests to determine whether hydro-skis will be installed on future production models.

Martin Fits Mariner With Edo Hydro-Skis

Martin PBM Mariner seaplane, first aircraft of its size to be equipped with hydro-skis, has been moved to the Naval Test Center at Patuxent, Md., for tests to determine whether hydro-skis will be installed on future production models of the 55,000 lb. aircraft.

Already tested by the Martin Co., the hydro-skis were designed by the Edo Corp. under a Bureau of Aeronautics contract. The company had earlier experience as far back as 1949, when a single hydro-ski was fitted to a Grumman Goose seaplane.

Purpose of the hydro-ski is to reduce the impact in rough water landings and takeoffs.

Navy tests are expected to prove that the rigid ski on a single strut acts as a better shock absorber than the conventional V-bottom hull.

The Edo-built ski is about one-fifth the length of the PBM. Located just forward of the aircraft's center of gravity, it vastly reduces the area of water contacted during a landing and places the contact nearer the center of gravity. The run required for takeoff is sharply reduced as the ski provides lift even while under water.

Early tests were held in a towing tank with a PBM model at the National Advisory Committee for Aeronautics Laboratory at Langley AFB, Va.

Advertising Proposal

Civil Aeronautics Board has proposed a one-year extension of regulations permitting local-service airlines to exchange transportation for advertising.

At the same time, CAB intends to amend the regulation to include certificated cruise carriers, of which Resort Airlines is the only one of its class, and to increase the limitation of the aggregate value to be traded by any one carrier from $25,000 to $50,000 a year.

Due date for comments from interested parties was set for late this month. CAB dispensed with the normal 30 day waiting period because all the carriers concerned had requested the extension and amendments as proposed.

Certificates of Necessity

Bendix Aviation Corp., North Hollywood, Calif., has been awarded a $925,000 certificate of necessity for research and development facilities by the Office of Defense Mobilization with 40% of the amount allowed for rapid tax amortization.

Other recent certificates include:

Hayes Aircraft Corp., Birmingham, Ala., military aircraft modification facilities, $606,515 certified with 45% allowed.

Cessna Aircraft Co., Wichita, Kan., military aircraft, $225,000 certified with 60% allowed.

Electro Engineering Works, San Leandro, Calif., research and development facilities, $66,300 certified with 35% allowed.

Debbell and Richardson, Inc., Hazardville, Conn., research and development facilities, $38,500 certified with 45% allowed.

Allen-Bradley Co., Milwaukee, Wis., military electronics, $721,900 certified with 65% allowed.

Allied Research Products, Inc., Baltimore, Md., aircraft parts $91,700 certified with 50% allowed.

Bell Aircraft Corp., Fort Worth, Tex., military aircraft, $26,000 certified with 60% allowed.

Vahl, Inc., Brooklyn, N. Y., military aircraft parts, $51,649 certified with 70% allowed.

Douglas Aircraft Company, Inc., Long Beach, Calif., military aircraft, $49,043 certified with 65% allowed.

Protair Corporation, Los Angeles, Calif., military aircraft, $16,875 certified with 70% allowed.

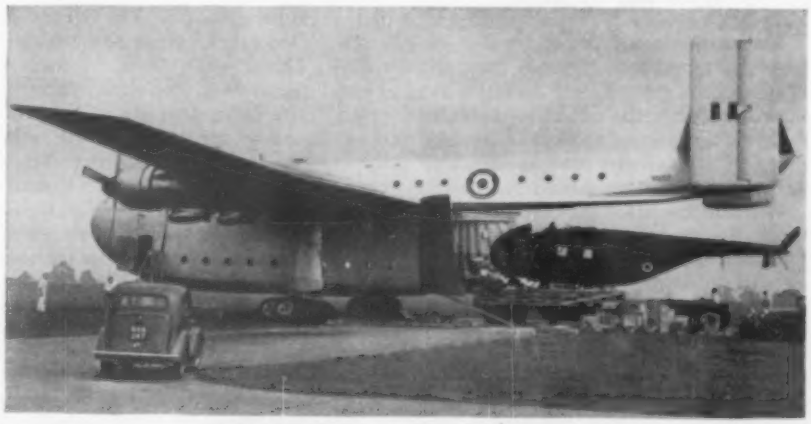
All American Engineering Co., Wilmington, Del., research and development, $154,936 certified with 55% allowed.

Curtiss-Wright Corp., Elk, Cameron and Clearfield Counties, Pa., research and development, $580,000 certified with 50% allowed; $667,000 certified with 70% allowed.

National Water Lift Co., Kalamazoo, Mich., military aircraft parts, $145,000 certified with 45% allowed.

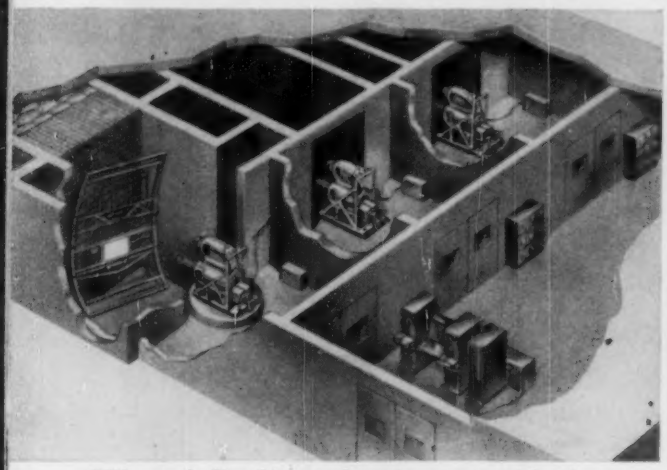
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., research and development, $718,545 certified with 40% allowed.

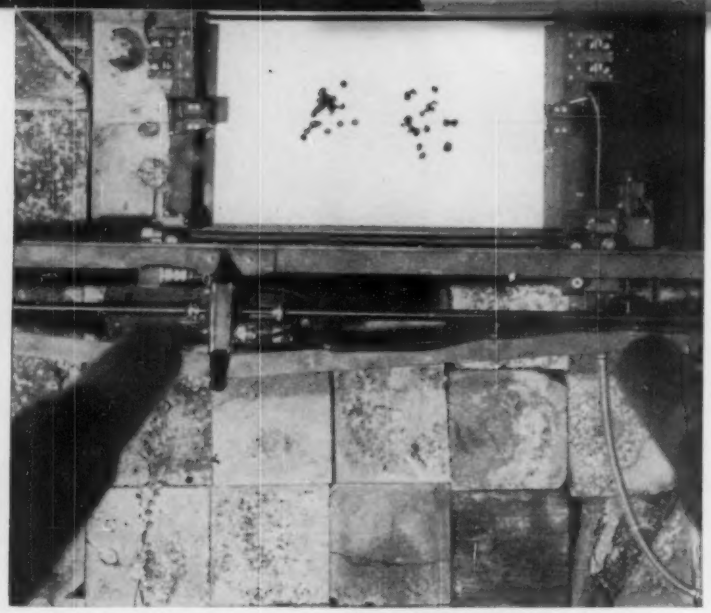
Goodyear Aircraft Corp., Litchfield Park, Ariz., military aircraft parts, $47,332 certified with 65% allowed.



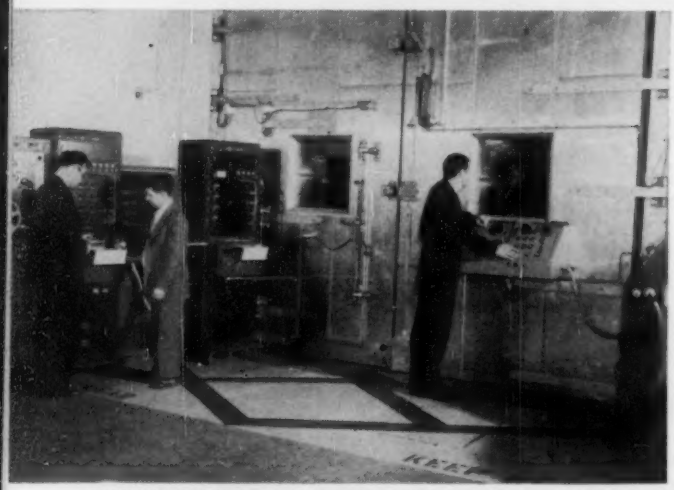
Blackburn's Behemoth

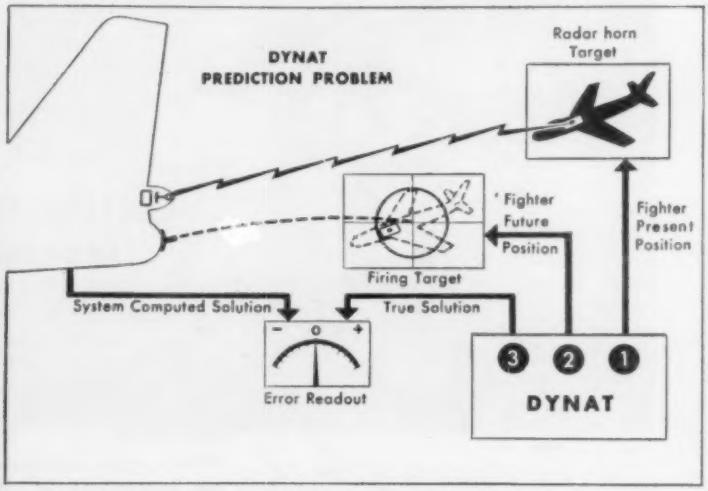
Blackburn Beverley freighter, shown above accepting a stripped-down Westland S-55 helicopter, will undergo winterization trials in Canada. A tanker version also has been developed.





GE'S new facility (l.) tests dynamic accuracy of bomber armament system, including gun firing (r.) under simulated flight conditions





DYNAMIC ACCURACY TESTER (DYNAT) above, will slash lengthy flight test time previously needed to evaluate a new armament system.

General Electric, Westinghouse Facilities

By Philip J. Klass

Two major producers of bomber defense armament systems recently opened new ground test facilities designed to check the critically-important dynamic accuracy of their radar-directed fire control systems under simulated airborne combat conditions.

General Electric's Aircraft Products Dept., Johnson City, N. Y., has a new facility which checks dynamic accuracy of a fire control system, including gun firing, under fully simulated flight conditions such as vibration, extreme temperatures, own-ship or target motions, windloads and radar noise.

Westinghouse Electric's Air Arm Division, Baltimore, has designed its test station primarily as a production-line facility to permit, if desired, the dynamic accuracy check-out of bomber fire control systems at temperatures as low as −54C.

The General Electric test station, called Dynat (Dynamic Accuracy Tester) already has produced some surprising data in its few weeks of operation. Based on limited tests, GE now suspects that the probable overall accuracy of its bomber defense systems is considerably better than previous estimates indicated. In the past, the company has assumed the worst possible build-up of errors in its fire control systems. Dynat tests to date indicate such an adverse build-up does not actually occur.

"This may explain the rather phenomenal success we've had in shooting down target drones," a GE spokesman said.

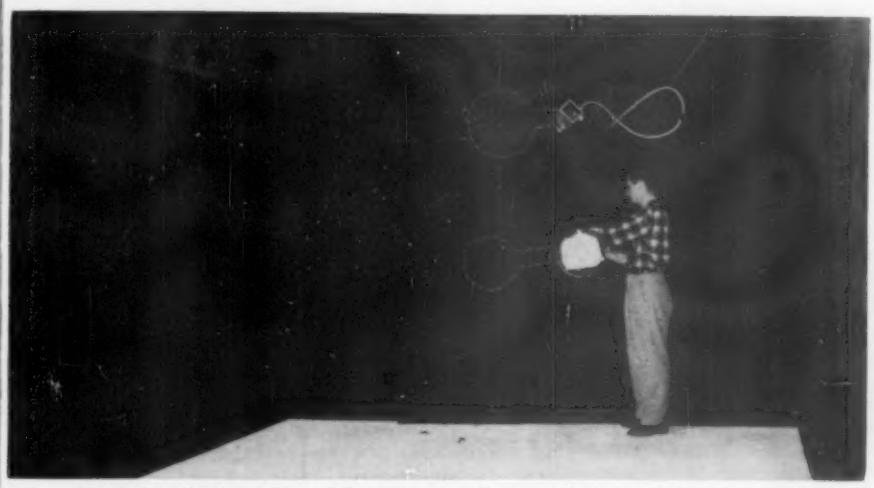
General Electric expects its new Dynat to greatly reduce the extensive flight tests previously required to evaluate the accuracy of new fire control systems. In some respects, Dynat tests are expected to be superior to those obtained from flight tests.

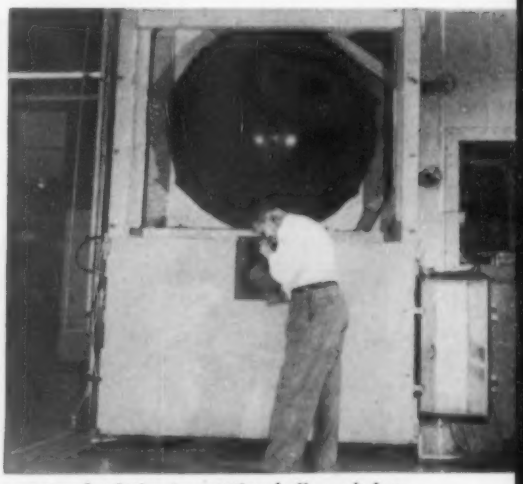
For example, if an interceptor is used as a target for testing a bomber tail-turret system, it is necessary to substitute cameras for gunfire. Before the results of the mission can be evaluated, it is necessary to go through a time consuming process, developing the film, correlating, scoring it frame by frame, and then reducing the data.

The only other flight test alternative is to use slow, unrealistic tow targets or expensive drones.

In addition, in actual flight testing it is difficult to get the interceptor to make just the right kind of pass and even more difficult to make identical repetitive passes for purposes of com-

WESTINGHOUSE combined cold chamber (l.) and radar "free-space" room (r.) for production line tests on its bomber defense systems.





RADAR tracks target horn (left top) mounted on rotating arm, while turret aiming error is measured relative to rotating bullseye below.

Test Accuracy of Fire Control Systems

paring the effect of minor equipment modifications if, indeed, these can even be made on the equipment during flight.

With its new Dynat, GE can set up any desired interceptor-bomber aerial duel, repeat it as often as desired, making equipment changes between runs if desired. This makes it possible to obtain sufficient controlled data to permit the use of statistical techniques in establishing probable system errors. Furthermore, important data, such as system tracking errors, are immediately available from strip-chart recorders.

Possibly the most significant of these many advantages is the accuracy obtained. "Dynat permits complete evaluation of a fire control system to an accuracy surpassing that possible in flight," according to GE's Allen French. Total overall Dynat error is less than ¾ angular mil, according to French. (An angular mil is approximately equal to 3¾ minutes of arc.)

How Dynat Operates

In a typical evaluation of GE's bomber defense armament systems, the tail package, including tracking radar and gun turret, is mounted on a stand. This stand is designed to have the stiffness and dynamic characteristics of the actual airplane mounting, according to French.

The present position of the attacking target is simulated by a movable target (radar horn) which transmits radar energy to the radar antenna to simulate that which would ordinarily be reflected from an attacking interceptor. The fire control radar does not transmit, one departure from complete simulation.

The horizontal and vertical position of the radar target in effect is varied in accordance with command signals generated by a set of "present position" cams.

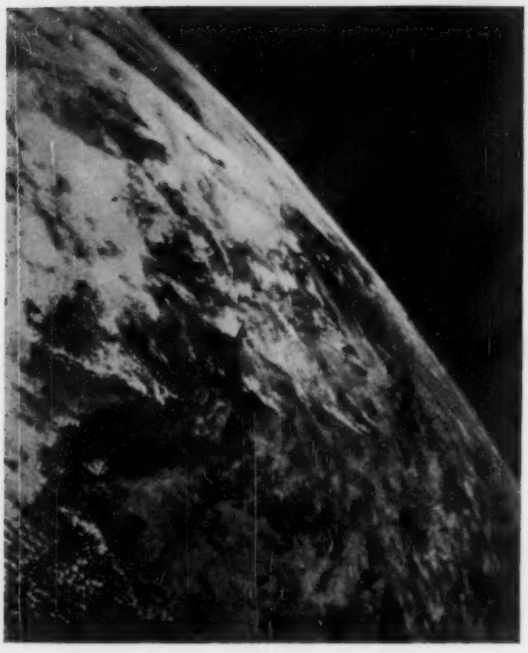
By changing these cams, it is possible to change the simulated course flown by the attacker.

In actual practice, to permit the use of a narrower firing chamber, the radar target remains fixed in azimuth, while the platform mounting the tail turret package is rotated in azimuth. This creates the same effect as if the target were moving.

Computing Future Position

The fire control system computer calculates where the turret guns should be aimed (lead-prediction and ballistic corrections) so that the projectiles will hit the target at its "future position,"

There goes another one!
"Higher and faster than the last one, too... really out of this world, Harry."
"You're right, Al. Now I see what you've been harping about."
FLINTOM



No need for amazement, boys. In the short time since you earned your wings, rocket propulsion has been constantly conquering new frontiers of speed and space.

At RMI, recent major advances in the science of rocket power have made possible the production of new rocket engine designs far superior to the record-holding powerplants of today . . . superiority measured in terms of performance, reliability, economy and producibility.

Photo at left was taken at an altitude of 158 miles from an RMI powered Viking research rocket . . . world speed and altitude record holder for single stage rockets.

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i.e. where it will be when the projectiles get out there.

For the particular attack course being simulated, GE engineers have previously computed the target's true future position for every present position and cut another set of cams which represent this future position. Signals generated by these cams are used to automatically position a bullseye target card mounted below and displaced by the prediction and ballistic correction angles from the target radar horn. Thus, at all times the bullseye represents the future position of a target whose present position is represented by the radar feed horn.

Hit or Miss

If the fire control system under test has computed the correct future target position, and the turret positioning system is operating properly, when the guns are fired at the target (approximately 20 feet away), they will score hits on the crosshairs (see photo, p. 26). An overall fire control system error of one angular mil will cause the projectiles to miss the crosshairs by ¼ inch, with larger deviations for larger system errors.

Because of the possibility that poor response of the turret servo system may produce some aiming error, despite the fact that the fire control system computer has correctly calculated the future target position, a third set of master cams is cut to represent the theoretically correct answer which the computer should produce. This is compared with its output and any deviation error can be recorded.

By changing cams, GE can test any bomber or fighter fire control system configuration, including both disturbed and director types, for tail, nose or beam-type attacks.

Simulated Airborne Environment

GE has gone to great pains to simulate the full environment normally encountered by fire control systems. For example:

• **Own-ship and target motions,** in any combination of roll, pitch and yaw, can be simulated by movement of the radar target and tail assembly platform or by mounting the antenna separately on a scoresby.

• **Radar noise,** either target-generated (countermeasures included), atmospheric or internally generated, can be simulated. This is accomplished by using an Ampex seven-channel tape recorder to play back radar noise which has been recorded previously in flight or artificially created. GE plans to synchronize this radar noise input to the course cams.

• **Ship's vibration and shock** is simulated by mounting the tail turret on a stand whose stiffness and dynamic characteristics closely follow that of the airplane. Thus, when the guns are fired, they produce realistic vibration and shock.

A tape recorder can be used to program and introduce circuit noise, jitter and power supply fluctuation.

• **Windloads** comparable to those imposed on the gun barrels in flight are simulated during tests by means of weights and shock cords which apply the proper load on the guns proportional to their angle of deflection into the windstream.

• **Temperatures** of −100F to 160F can be produced in the Dynat firing chamber where the tail turret assembly is undergoing test. If more extreme temperatures are needed, or if it is desired to subject the fire control system to operation at extreme altitudes and humidity, the tail turret assembly can be moved nearby to a large environment chamber. Here the system can be run through the same dynamic accuracy testing, except for the actual firing of the guns.

Westinghouse Test Station

The Westinghouse facility, because it is designed for production-line testing, is somewhat less sophisticated than Dynat. Also, the Air Arm Division has an outside firing range designed to permit a fire control system to be placed in a cold chamber and subjected to extreme temperatures while it is being fired.

In the Air Arm facility, radar energy is transmitted from the fire control system antenna and beamed at the target horn. These pulses are then used to shape and generate "echo" pulses which are suitably delayed and then transmitted back from the target horn to the radar antenna and receiver.

Echo-Less Radar Room

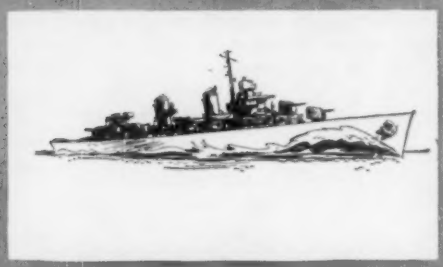
To prevent side lobe energy from the radar antenna from bouncing off the walls and ceiling of the room in which the target horn is located, causing spurious echos to be reflected back to the antenna, Westinghouse constructed a special "free-space" room. The room is completely lined with a matting material, developed by McMillan Industrial Corp., which absorbs radar energy, reducing reflected energy to a satisfactory minimum.

Rather than attempt to refrigerate the large free-space room, which is located adjoining the cold-temperature chamber, Westinghouse built a novel intermediate room, about 3-ft. wide, which joins the cold chamber and the free-space room into a single working unit.

This middle chamber is constructed of wood, fully insulated, and exposed on one end to the low temperature of the cold chamber. The tail turret system is installed in the middle chamber. Here it is exposed to the cold temperature, yet its radar performance is not adversely affected as it would be if installed in the steel cold chamber itself (see photo, p. 27).

A flat plastic plate, located between the radar antenna and a hole cut in the

MASTER CAM PLAYER (foreground) programs any desired simulated interceptor attacks, simultaneously moving a bullseye target to exact position where turret gun should be aiming.



NEW FAIRCHILD SHIPBOARD RADAR SYSTEM FOR AUTOMATIC SEARCH AND TRACKING

Fairchild radar systems have gone to sea with missile launching cruisers of the U. S. Navy.

Now operating with the fleet, the Fairchild SPQ-2 Shipboard Radar System shown here was developed to search out and track either missiles or aircraft completely automatically. And, controls have been "human-engineered" to facilitate operation under battle conditions.

Color and shape coding in this new Fairchild radar assure rapid, sure identification of all controls. Rugged, shock-resistant construction protects equipment.

Here again is proof of Fairchild Guided Missiles Division's continuing leadership in design, research and production of vital electronic equipment.

A Division of Fairchild Engine and Airplane Corporation

Enlist to fly in the U. S. Air Force

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GUIDED MISSILES DIVISION • WYANDANCH, N. Y.

...WHERE THE FUTURE IS MEASURED IN LIGHT-YEARS!

side of the free-space room, seals off the cold temperature, yet enables radar energy to pass through into the free-space room and its target horn. This plate causes less than one angular mil of radar beam boresight shift, according to H. J. Leone, head of Air-Arm test facilities.

The turret guns protrude through another cut-out in the middle chamber into the free-space room, but a "horse-collar" seal around the turret serves to maintain a satisfactory temperature seal.

Rotary Target Motion

The target horn which the radar tracks is attached to an arm which is rotated at a constant pre-selected velocity. Another arm, driven from the same motor, rotates the aiming bullseye card. For any selected rotational velocity of the target horn, there is a fixed angular relationship between its position and that of the correct gun aiming position (bullseye card).

Overall system errors will show up in gun aiming-point deviation from a small light on the moving bullseye. This deviation can be recorded by means of a camera attached to a gun barrel, or by having an observer look through a specially calibrated boresighting telescope.

FILTER CENTER

► **Predicting Reliability**—Dr. R. R. Carhart, former Rand specialist on reliability who is now with Lockheed's Missile Systems Division, will take issue with those who believe that avionic system reliability can be predicted accurately from data on reliability of individual components, in a paper scheduled for the Second National Symposium on Reliability and Quality Control in Electronics, Hotel Statler, Washington, Jan. 9-10.

► **Delta to Buy New Avionics**—Delta Air Lines reports it will soon install new HF transmitters and receivers, selective calling (Selcal), automatic direction finders, and Collins C-band radar for its entire fleet of DC-7s, DC-6s and Convair-Liners.

► **Arinc Moves**—New address of Aeronautical Radio, Inc., is 1700 "K" St., N. W., Washington 6, D. C. New building will house both Arinc's airline and military activities.

► **BEA Adopts Decca**—British European Airways will equip its entire main line fleet with the British Decca short-distance navigation system, following 50,000 hours of flight evaluation in BEA Viscounts and helicopters.

► **Remote Control Flattop**—Britain's first "atom age" aircraft carrier, the HMS Ark Royal, has been equipped with closed circuit TV which will enable

the crew to maneuver the flattop by remote control from sheltered compartments. The closed-circuit TV also will be used to provide operational information and entertainment to all parts of the ship.

► **ASR for South Africa**—The Jan Smuts Airport, largest civil facility in the Union of South Africa, will be equipped with a British Marconi S.232 surveillance radar operating in the 500-610 mc. band. Installation is expected to be completed by next summer.

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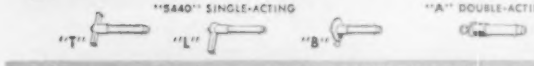
"neat-as-a-pin" answer
to BOEING B-47 service problems!

Standardization on PIP pins throughout the 1000-plus fleet of Boeing B-47's accomplishes quick-change servicing of essential electronic, photographic, landing gear, armament and safety equipment on board. Use of PIP double-acting, quick-release, positive-locking pins in a wide variety of sizes reduces equipment installation and removal time . . . helps keep our jet fleet *always on the ready!*

an accepted part in industrial, military and aircraft designs—

pip SELF-LOCKING QUICK-RELEASE PINS

Assemblies requiring disconnecting and rejoining are just right for PIP pins! They provide quick release and positive self-locking safety in a single unit in blind or open applications. No cotter pins, nuts, bolts or other separate retaining items or assembly tools are needed. Supplied in any diameter or length.



Complete literature available on request.

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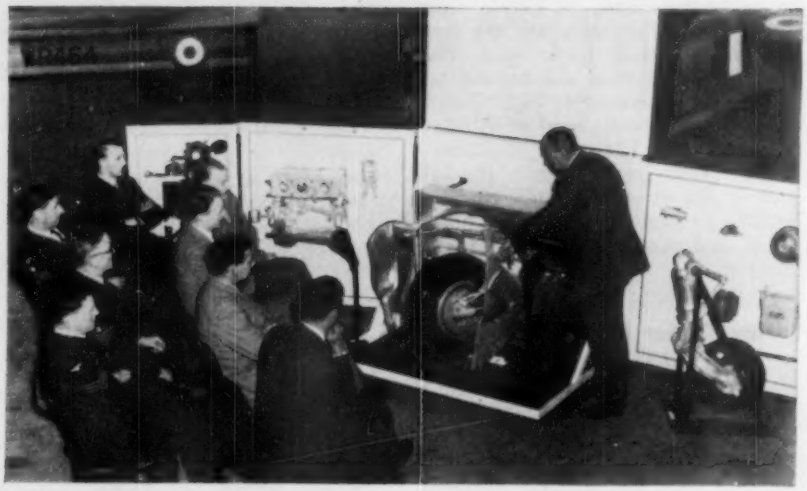
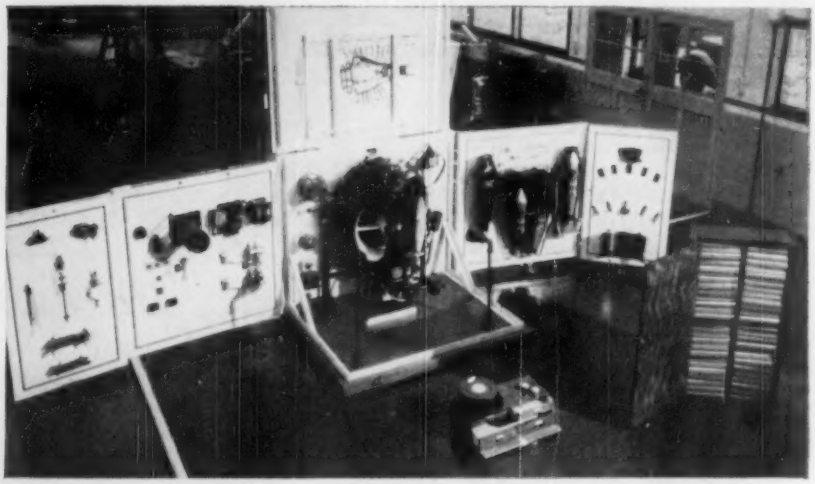
De Havilland Packages Ground Trainer



MAIN UNDERCARRIAGE LEG is fully operable in this portable ground trainer for DH Vampire. Other panels show fin, tailplane, throttle and flight control details.



GOBLIN ENGINE KIT includes operable starting system (center), sectioned combustion tube assemblies, burner setting tools and specimen stator and turbine blades. Engine kit forms single package for easy shipment by air.

'Near Miss' Report Considered by CAB

A voluntary system for pilots to report "near-misses" between aircraft in flight is under consideration by the Civil Aeronautics Board.

CAB has issued a notice of proposed rule making (DR No. 55-30) for establishing a program to encourage "pilots and other persons to make voluntary reports of near mid-air collision information." Due date for receipt of comments from interested parties is Jan. 16, 1956.

The Board said the purpose of a "near-miss" reporting program is not to enforce existing rules of the air by taking disciplinary action against the pilots concerned, but by a systematic analysis of these near-misses and the determination of their causes, to find a way of avoiding them in the future.

The information obtained, CAB noted, is also to be used in the evaluation and development of air traffic control procedures, separation criteria and Civil Air Regulations.

The Board said that the seriousness of the near mid-air collision problem accentuates the need for a reporting program. The biggest drawback to having a successful reporting system, CAB said, is the pilot's fear of possible Government enforcement or other disciplinary action. This point was proved in the past year when CAA transferred the handling of "incident" reports from the Office of Aviation Safety to the legal department. The pilots bitterly complained of the CAA action and in retaliation have since refused to file reports.

WHICH WAY'S UP ?

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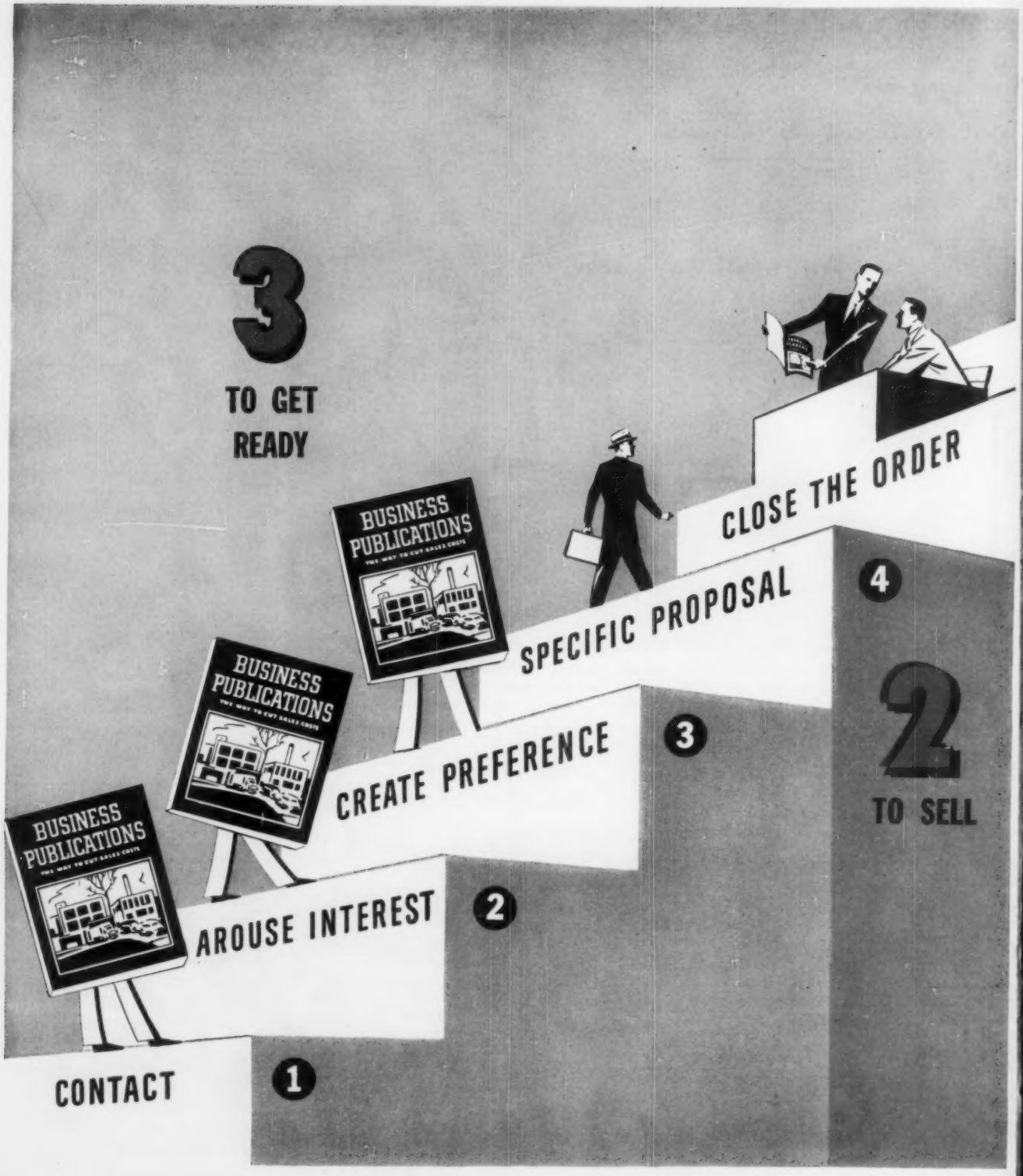
RO-19

SIX STEPS to


3
TO GET READY
BUSINESS PUBLICATIONS
BUSINESS PUBLICATIONS
BUSINESS PUBLICATIONS
CONTACT
1
AROUSE INTEREST
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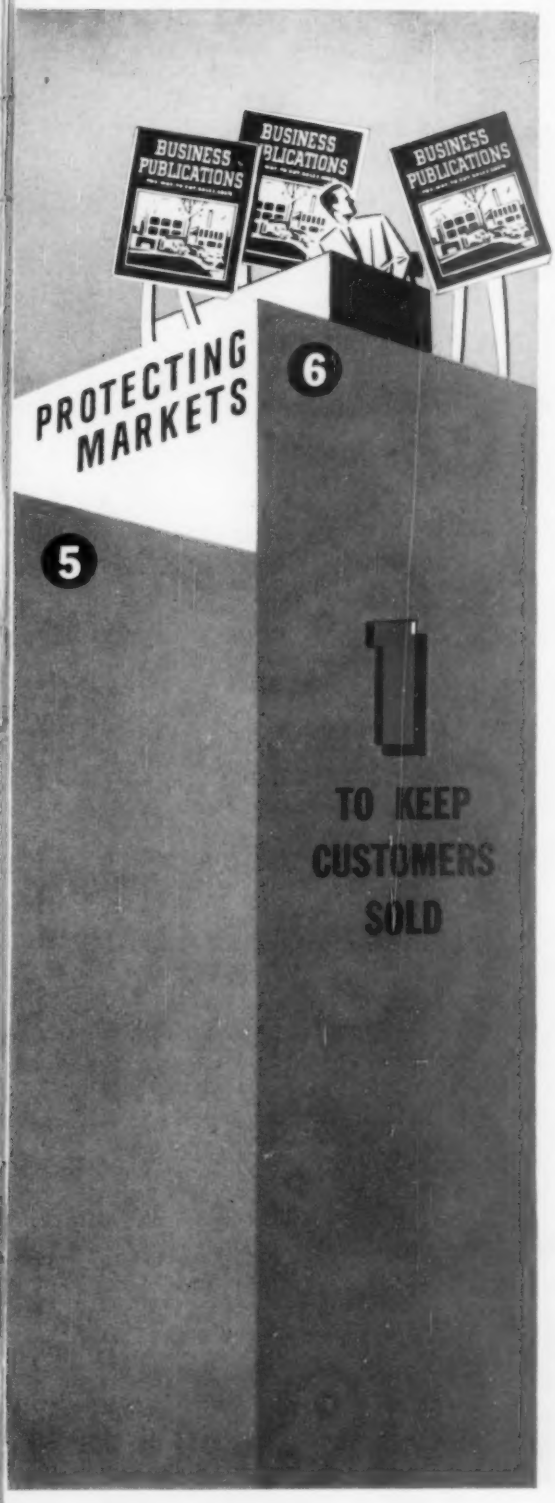
CREATE PREFERENCE
3
SPECIFIC PROPOSAL
4
CLOSE THE ORDER
2
TO SELL

Successful Selling



Selling is an old profession with new problems. The basic steps to a sale are the same. The salesman must still contact the prospect, arouse his interest, create preference for his product . . . before making the proposal and closing the sale.

But there are new angles. Because modern industry is more complex and more decentralized, the salesman must contact more people and travel more miles per sale. Add to these facts the problem of selling in a highly competitive market, and it becomes obvious that the salesman needs help.

The best help you can give your sales force is consistent and adequate advertising in business publications. Such advertising MECHANIZES the first three steps in the manufacture of a sale. It makes contact with known and unknown buying influences at pennies per call . . . enables the salesman to use his selling talents on the important pay-off steps of the sale . . . keeps his customers sold between calls.

An interesting 20-page McGraw-Hill booklet, "Mechanizing Your Sales with Business Paper Advertising", is yours for the asking. Your McGraw-Hill salesman will be happy to give you a copy of this booklet, and also tell you about our sound slide film, "Plateau of Progress" which is available for showing at sales and management meetings.

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One-Piece Castings Slash Plane Weight

By Irving Stone

Los Angeles—One-piece thin-wall precision castings made of non-ferrous metals are being considered as substitutes for heavier, more-expensive built-up assemblies in missiles and aircraft.

One of the best examples is a complete wind design-skin, beams, ribs and stiffeners that R. H. Osbrink Mfg. Co. has investigated for the military to determine the feasibility of its production as a one-piece casting.

C. H. Butler, Osbrink's chief engineer, says inquiries from airframe manufacturers embrace a wide variety of applications. Among them:

- **Wings and control surfaces.**
- **Missile bulkheads.**
- **Canopy and windshield frames.**
- **Complex air ducting.**
- **Avionic "plumbing"** (wave guide) systems of high complexity.
- **Doors and fairings.**

Osbrink has built components in these categories before, but Butler says the trend now is towards larger components of more intricate makeup. This stems from advanced design requirements. The objective is to incorporate as an integral part of the casting as many formerly fabricated subassemblies as possible.

As an example, the wing panel design which Osbrink studied would be a one-piece magnesium casting 189 in. long, 129 in. at the root and 54 in. at the tip. The company now is preparing a proposal for the casting job.

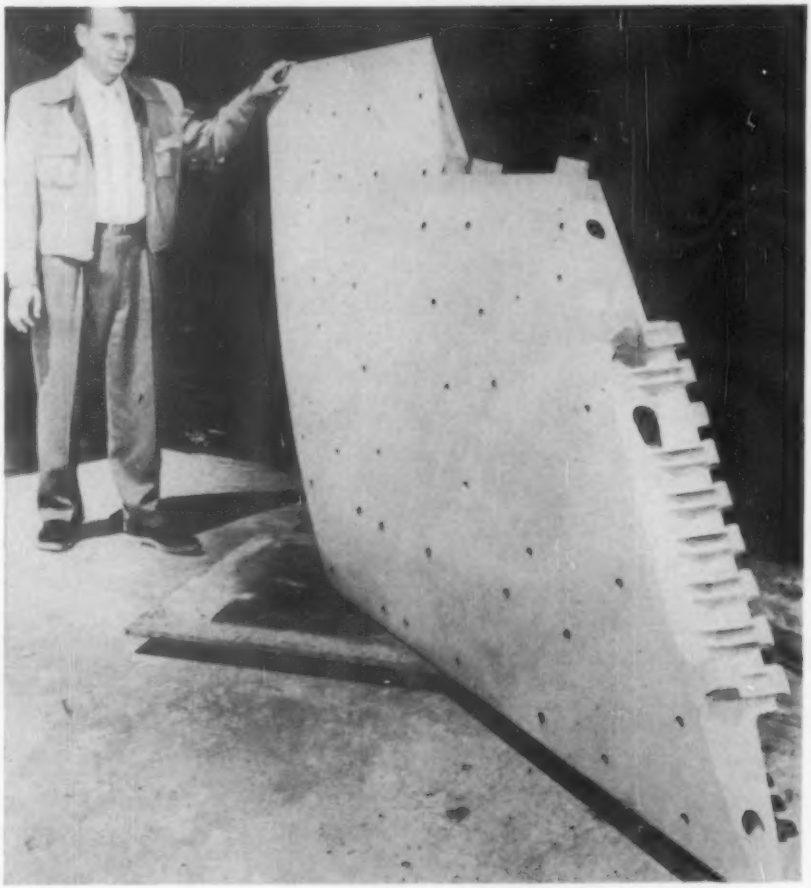
Weight Saving Is High

Weight saving obtained through use of thin-wall castings may run as high as 30% in particular applications, according to Butler.

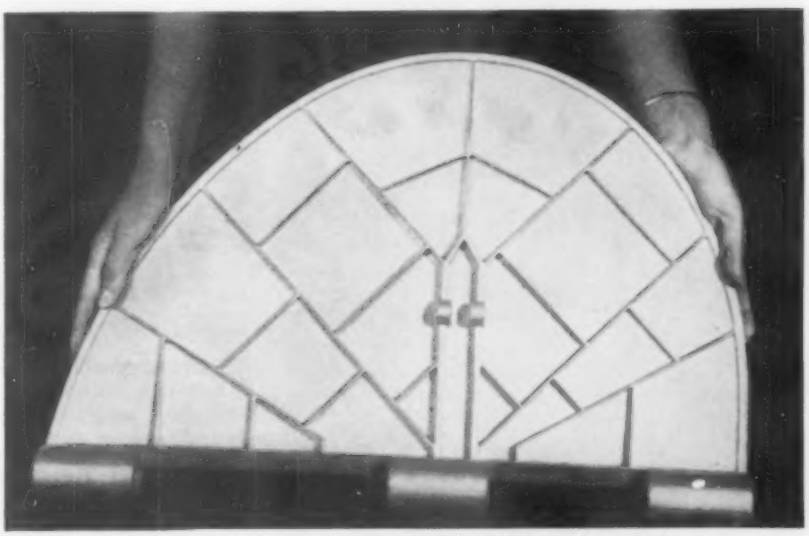
This saving is a result of refined casting design and improved mechanical properties inherent in thin-wall cast sections.

Butler reports that static tests on thin wall castings show an extreme minimum strength factor of about 160% of design load. The general minimum strength factor is more in the neighborhood of 190%. In certain instances, static strength has run well over double the design load factor, and fatigue testing has shown that parts generally last at least twice the design life expectancy.

These test results indicate that de-



CAST MAGNESIUM outer wing panel for Chance Vought Regulus I missile.



PRECISION-CAST access door has very thin (.050 to .060 in.) skin and ribs.

"For Want of a Nail..."

For want of a nail the shoe is lost,
for want of a shoe the horse is lost,
for want of a horse the rider is lost.

George Herbert's statement applies to electronics today as it did to riders three centuries ago. The point may be illustrated by considering a vital electronic unit made up of thousands of components. If the least of these components fails, the whole unit may fail—and with it a strategic military mission.

The problem of *reliability* is becoming increasingly important as the science of electronics advances. "Black boxes" are hard pressed to perform more complicated tasks with increasing efficiency. And at the same time, the requirements call for smaller dimensions. Notwithstanding environmental extremes of an order hitherto unknown, every resistor, capacitor and relay *must* perform *reliably*. Each "nail" is critical.

That is why RCA is continuing its vigorous search for ways and means to increase the reliability of every component in an electronic unit. This program never ceases. It follows through from design to field evaluation. Everything learned is immediately applied to current development and production.

In seeking a degree of electronic perfection never before attained, RCA joins hands with others in this field. This matter of *reliability* is an industry challenge to be met by ingenuity, brain power and engineering knowledge wherever it is found.

DEFENSE ELECTRONIC PRODUCTS
RADIO CORPORATION of AMERICA
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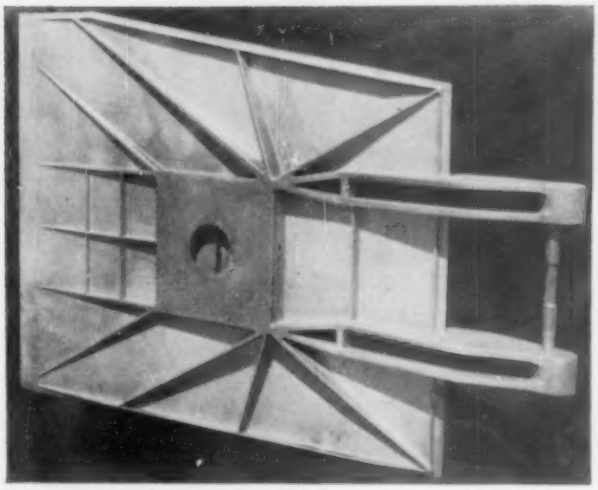
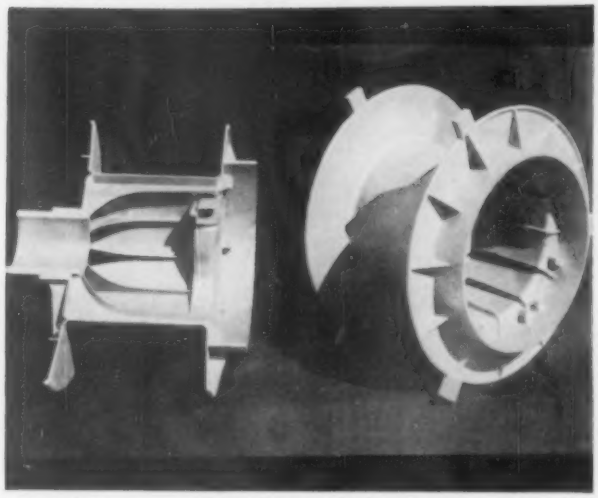
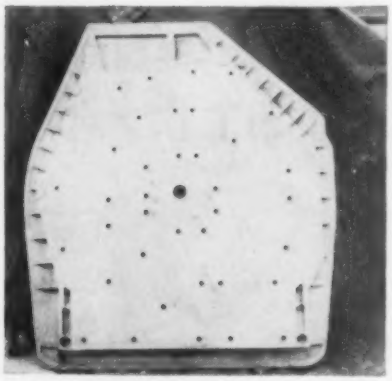
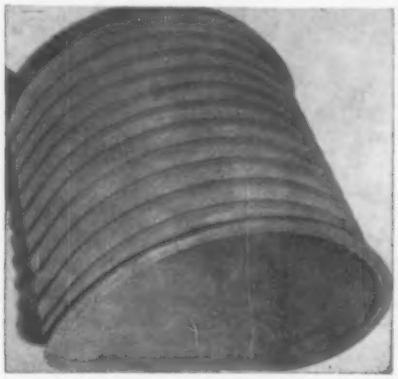


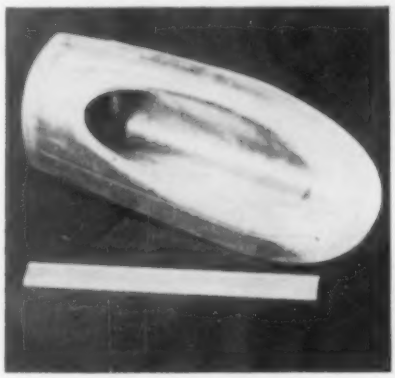
FIGHTER SPEED BRAKE saves five lb. over sheet-metal counterpart.



REEL of dip-sonar assembly is 13 lb. lighter than a built-up unit.







OTHER PARTS CAST by Osbrink include landing gear wheel well door (l.), air intake duct (center) and gun blast tube (r.).

signers can bring about even greater weight savings in castings by designing to higher strength allowables and correspondingly thinner sections. Of equal importance is the factor of continuity found in integral cast structure, which allows reduced cross-sectional areas of internal bracing.

One of the newest thin-wall casting jobs at Osbrink, for which tooling now is being made, is a belly air duct for an advanced missile design. This magnesium duct measures approximately 4 ft. long, 3½ ft. deep, by 4 ft. wide. "It is probably one of the most complex castings we have yet attempted," Butler said.

The duct is a combination air inlet and three adjacent boundary layer bleed passages evolved from a single contoured rectangular opening. Butler believes that, compared to the built-up counterpart on the prototype, a weight saving of 10-15% may be achieved.

There also would be a considerable saving in production time.

Other examples of precision castings Osbrink is producing or has produced:

• **Outboard wing panel** for Regulus I missile. Leading edge measures 69 in., while distance between leading and trailing edges is 76 in. Area is approximately 28 sq. ft.

The minimum skin thickness inboard is .200 in., tapering to .130 in. outboard. Between the skins are integrally cast main beams and stiffening ribs. The thickness of these members is comparable to that of the skin. A wingfold hinge also is integral with the casting.

Airfoil surface has an as-cast finish equivalent to a 125 rms. machined finish.

The casting is made from AZ-63-A, T-2 magnesium. It weighs 163.3 lb., paring 65.2 lb. from the corresponding built-up assembly. Approximately 460 assembly hours are saved. Paper work is shaved about 750 pieces and 48 hours of issuing time to about six pieces and 30 minutes issuing time. Some 2,000 fasteners are eliminated.

• **Prototype missile wing panel.** This magnesium outboard section has a maximum airfoil thickness of only 2¼ in. It is cast with integral beams, ribs and wingfold hinge. Skin thickness varies from 1.50 to .250 in. Area is 18 sq. ft.

Gun blast tube, cast in aluminum and hard-anodized, is intended to replace a heavier stainless steel unit. Thickness averages about 1.25 in. a periphery skin step is cast to size to fit the contour of the plane, so that no machining is required before installation.

Tests have shown that the aluminum casting withstands firing shock and fume corrosion. Originally cast for McDonnell aircraft, the gun blast tube is being adopted by other companies, according to Butler.

• **Airborne dip sonar reel.** Designed for use with anti-submarine search helicopters, this magnesium assembly consists of a frame, reel and end housing. Overall size is about 24 in. high, 20 in. wide and 20 in. deep.

The cast reel and frame assembly is a completed redesign of the existing fabricated unit, and saves 13 lb. in weight. All walls and ribs are .100 in., except for the base which is .250 in.

Passages for electrical conduit are cast integral with the frame.

• **Landing gear wheel well door.** This prototype cast magnesium article was made for an interceptor. A double wall configuration, the part measures about 48 by 40 in. and maintains a skin and rib thickness of about .100 in. on the outer 10 in. of the periphery.

The door was cast in a pre-warped

condition to give an "oil canning" effect for tight seating.

• **Access door.** A semi-circular configuration, this prototype magnesium article is about 1½ ft. in diameter. Skin and ribs are held to between .050 and .060 in.—a thickness value not recommended for production runs.

• **Air intake duct.** This is a D-shaped prototype unit cast from ZK-51-A, a zirconium-magnesium alloy. Stiffening ribs are spaced along the duct exterior, with lightening holes in the webs. Thickness of the rib and duct walls is .100 in. Size of the duct is about 22 in. long, 18 in. wide and 24 in. high.

Another duct, now under study for a major airframe manufacturer to determine feasibility for casting, is a complex structure about 4 ft. in length, with a rectangularly shaped opening measuring 20 by 26 in. Ribs of varying height (2 in. to 5 in.) on the exterior surface are spaced at 5-in. intervals. Rib ends are flanged in two directions.

Compared to the sheet metal fabricated counterpart it is estimated that at least 50% of production time will be saved.

• **Speed brake.** Designed for a carrier-based fighter, this part measures about 30 by 40 in. skin thickness, and is .120 in. throughout. Four of these brakes are required per plane. Each casting is 5 lb. lighter than its sheet metal counterpart, so 20 lb. is saved per plane.

Licenses to use Osbrink's precision sand casting process for thin-wall units have been issued to Saunders Casting Co., Wichita, and Solon Foundries Inc., Solon, Ohio.

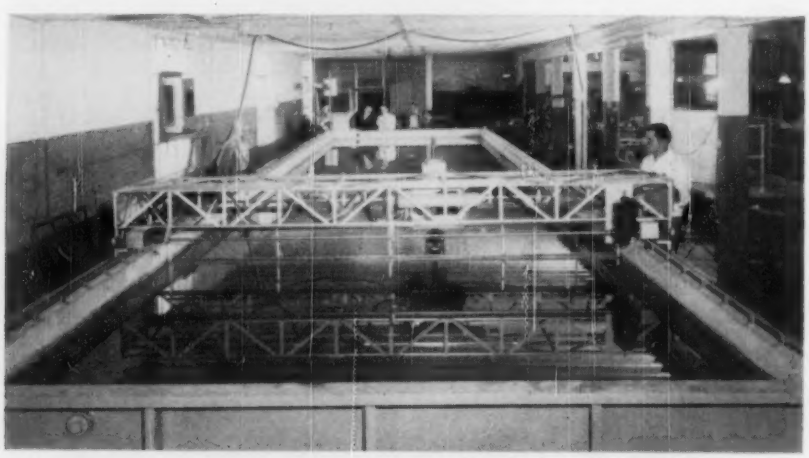
PRODUCTION BRIEFING

► **Pacific Division, Bendix Aviation Corp.,** has nearly completed an addition to its North Hollywood engineering building, increasing area from 23,000 sq. ft. to over 100,000 sq. ft. Facility will centralize all engineering activities now at three separate locations in the San Fernando Valley.

► **More than 40 different patterns** of Rigid-tex metal, made by a contour-rolling process that increases strength of assemblies and aids heat dissipation, are available in ferrous and non-ferrous materials, solid or perforated in sheet, strip or coil, from Rigidized Metals Corp., 736 Ohio St., Buffalo, N. Y. A recent application of the process has been titanium fabrication of the engine shroud on the P&WA J57 for Convair's F-102A delta-wing fighter (AW Oct. 17, p. 56). Rigidized titanium sheets are said to increase stiffness as much as 155%, permitting a weight saving of 27%, the maker reports.

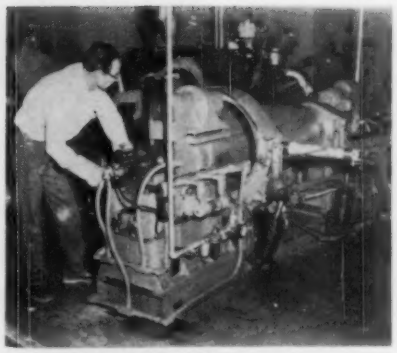
► **Ryan Aeronautical Co.,** San Diego, has started 45,000-sq. ft. addition to jet engine parts building, primarily for storage of active tools. Including other recent expansions, this will bring Ryan's total floor space to 850,000 sq. ft. Payroll has increased to about 4,700, a 1,000-man increase in the past year.

► **Assets or Industrial Sound Control, Inc.,** Hartford, Conn., have been acquired by Koppers Co., Inc., Pittsburgh, Pa.



Automatic Tester Finds Aluminum Flaws

The immersion-type ultrasonic tester shown here can inspect aluminum alloy slabs up to 48 ft. long, 10 ft. wide and 20 in. thick. It is reported to be the first fully automatic unit of its type. Capable of detecting a defect as small as ⅛ in. in diameter, and with a scanning speed ranging from ⅛ to 18 in./sec., it scans in a variety of patterns over the entire surface of the aluminum slab. If a flaw is detected, the operator is alerted by two alarms—a bell and a red light—and the defect is automatically marked. The operator then shifts to manual controls and can determine the size and shape of the flaw in terms of ultrasonic standard blocks. The tester was built for Kaiser Aluminum and Chemical Corp.'s Trentwood, Wash., rolling mill by Electr-Circuits, Inc., Pasadena.



EXTERNAL FUEL TANKS are turned out at rapid rate by this semi-automatic trimming machine developed by Pastushin Aviation Corp., Los Angeles, Calif. Requiring only loading and unloading, equipment's automatic gaging and controls permits 200 jettisonable aircraft tanks to be turned out each hour with only 48 people working on the line in a single shift. Entire metal trimming action, including loading and unloading of formed skins, requires only four minutes.

► **New aircraft seating manufacturer** is Flight Line Corp., with offices and plant at 8330 San Fernando Rd., Sun Valley, Calif. President is Wallace L. Jones; vice presidents are John E. Puhl and John W. McKee.

► **New and larger facilities** will be built for its Kansas City District offices by General Controls Co., Glendale, Calif. Address: 2904 Oak St., Kansas City, Mo.

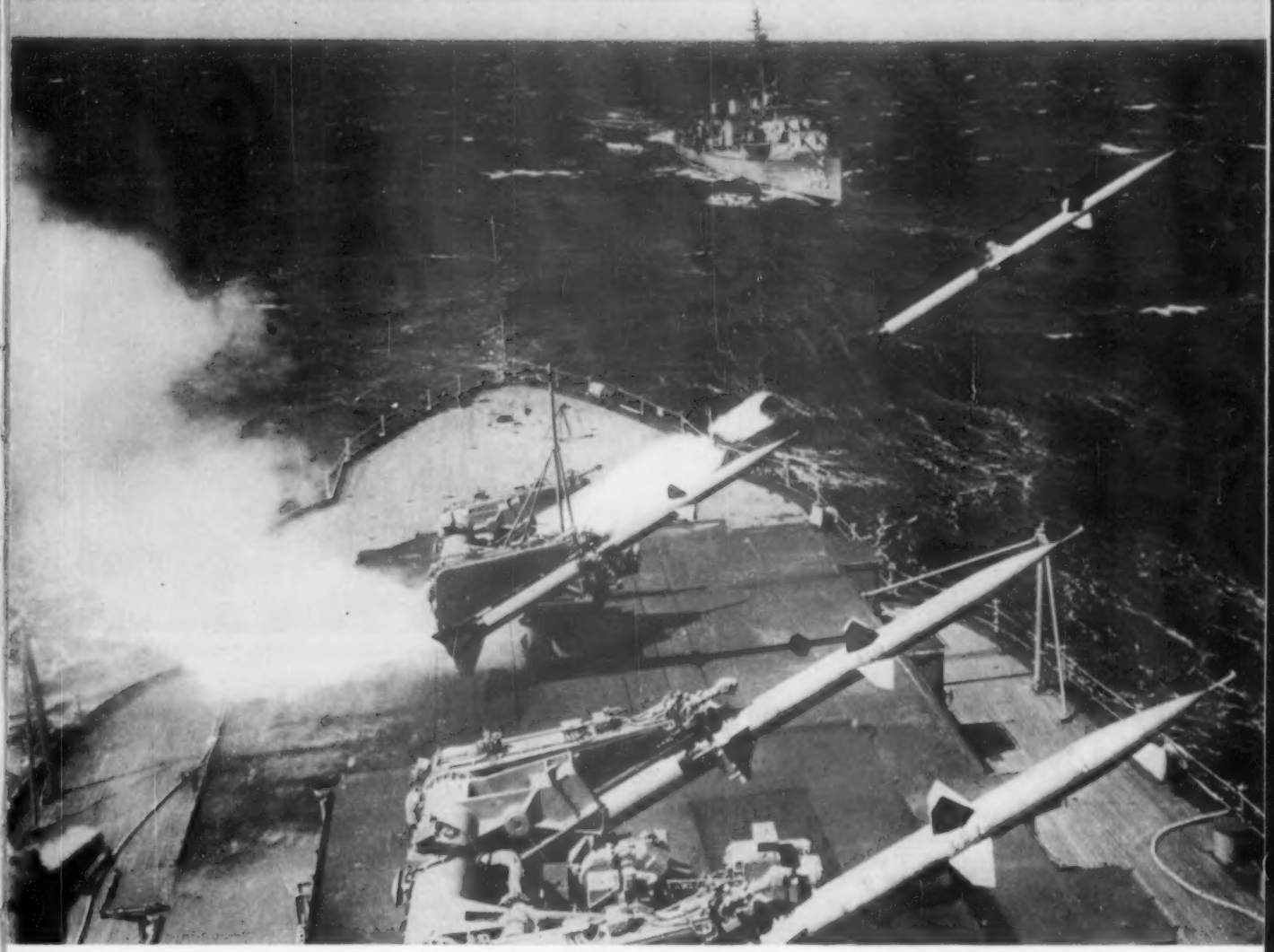
► **Fractional horsepower motor facilities** have been obtained by Hydro-Aire, Inc., Burbank, Calif., aircraft fuel pump maker, in merger with its subsidiary, Electro-Aire, Inc., N. Hollywood. Electro-Aire will continue to make motors for other companies.

► **Larger quarters** have been taken by Hetherington, Inc's West Coast Division at 139 Illinois Ave., El Segundo, Calif. Firm makes aircraft snap-action switches, indicators lights, relays and coils.

► **Canadian sales agent** for Aircraft Division of Ledcote Products, New York, is Noorduyn Norseman Aircraft, Ltd., St. Laurent, Quebec. Ledcote produces exhaust systems and airframe assemblies.

► **Doubled production facilities** is the aim of new 12,000-sq. ft. plant being erected by Lovequist Engineering Co., Los Angeles, Calif., aircraft parts firm and machine tools maker.

► **Air Logistics Corp.** is new corporate name of merged Hammond Manufacturing Corp., Pasadena, Calif., and its wholly owned subsidiary Air Logistics Corp. Hammond has been concerned



Terrier Test

Convair's supersonic Terrior anti-aircraft missile roars from launcher on deck of USS Mississippi during evaluation trials at sea. Note that wings of second rocket in battery have been deflected to roll position as part of pre-firing test. (Wings of second missile in foreground are in down position.) Escorting destroyer is the USS Krause (DD-849).

with aircraft and missile support equipment, its former subsidiary with trailer systems for the equipment, in addition to airborne military devices. Air Logistics will build a new plant on a 100-acre site in La Verne, Calif.

► **New laboratory facilities** have been opened in Dayton, Ohio, by Inland Testing Laboratories, Chicago, Ill., to handle qualification and endurance tests for USAF and its contractors.

► **New plant and office facilities** will be built in Los Angeles, Calif., by Pacific Scientific Co. The Aero Division with an instrument laboratory will be housed in a 17,300-sq. ft. structure.

► **Shock & Vibration Research, Inc.,** 820 Hammond Building, Detroit 26, Mich., is a new firm, which will prepare studies for manufacturers on mounting equipment for precision equipment such as radar and missile guidance systems. President is Robert L. McKay, formerly with Bell and Douglas Aircraft, and with the U. S. Army as a civilian scientist.

► **To mark its expansion in the aviation equipment field,** Scaffold Equipment Co., Pittsburgh, Pa., has changed its named to Champion Airquipment, Inc. Firm makes ground servicing equipment.

► **Sciaky Bros., Inc.,** have opened two new sales and service offices: 231 Healy Bldg., Atlanta 3, Ga., and 709 Bank of America Bldg., San Diego 1, Calif.

► **New plant and offices** at Gloucester, near Ottawa, Ontario, have been opened by Bogue Electric of Canada to support services to the Royal Canadian Air Force. New structure covers about 80,000 sq. ft. and will employ approximately 350.

► **Expansion of over $1 million** in aircraft manufacturing facilities is being undertaken by Axelson Manufacturing Co. division of U. S. Industries, Inc., at Montebello, Calif. New plant will comprise 120,000 sq. ft.

► **New 2,200-lb. vacuum melting furnace,** said to be the nation's largest, has been put into operation by the Vacuum Metals Corp., Syracuse, N. Y. Furnace, built by Equipment Division of National Research Corp., a joint owner of the firm, will turn out between 60 and 75 tons of purified metals monthly.

TWO TWIN-BONANZA MODELS will be available in 1956. The newest, the D50, has 295-hp. Lycomings turning three-blade propellers.

Beech Breaks Fast Toward '56 Record

By Erwin J. Bulban

Beech Aircraft Corp., Wichita, Kan., will begin its 1956 commercial sales year with a record-breaking $11.5 million in firm orders for business planes from its distributors.

This figure represents more than one-third of next year's target of $32 million in commercial sales set for the distributor organization by Mrs. Olive Ann Beech, president, at the company's annual sales meeting attended by more than 200 distributors, dealers and sales and service personnel from the U. S. and seven foreign countries.

Aiming Higher

The 1956 business plane sales goal represents an increase of approximately $5 million over the record $27.4-million-plus recorded this year.

At the close of the two-day meeting, Beech distributors and dealers flew away 30 new 1956 Bonanzas, one Super 18 and one Twin-Bonanza, representing $860,000 worth of airplanes.

Additional developments brought out during the meeting include:

• **Disclosure that Beech is developing** a new factory-backed financing plan for distributors. The plan will be a "GMAC-type deal" patterned after automobile financing plans. It will place an additional merchandising weapon in Beech distributors' hands, supplementing the lease plan worked out last year with American Leasing Corp., Hartford, Conn. Beech reports that the leasing program added some $1.5 million in sales to 1955's tally.

• **Beech has not reached firm decision** on production under license of the Morane-Saulnier MS-760 twin jet four-place business plane (AW June 27, p. 44), but indications are that the move is still pending. The company apparently is awaiting a decision from the military on MS-760 trainer orders.

• **Special honors were paid** to 11 U. S. and one export distributor for exceeding $1 million in sales in 1955. A total of 42 sales awards, ranging from a 1956 Cadillac through plaques and scrolls were distributed to top salesmen.

New Twin-Bonanza

More powerful engines, more range and higher performance keynote a new version of the Twin-Bonanza, which this year is being made available in both five and six-seat models. Baggage capacity has been doubled over earlier types.

Higher compression, providing 20 hp. more per engine, is featured in the D50's new Lycoming powerplants. Now delivering 295 hp. each, the engines are fitted with three-blade, full-feathering Hartzell propellers, another innovation.

The new powerplant-propeller combination gives the D50 a 6,300-lb. maximum gross weight, 300 lb. higher than last year's model. Useful load is now 2,319 lb.

Beech is continuing the C50 in 1956. This airplane has 275-hp. Lycomings and Beech feathering props. The D50 will cruise at 203 mph. at 70% power at 7,000 ft., compared to 198 mph. for the C50. Maximum range for the new D50 at 43% power (160 mph. at 10,000 ft.) is now 1,650 mi., compared to 1,475 mi. for the C50.

The five-seat D50 will have individual seats up front with an aisle between; in the six-seat configuration, the back of the co-pilot's seat can be removed for access to rear seats. Two baggage compartments take 450 lb. allowable weight in luggage, an average of 75 lb. per passenger in the six-seater.

Other important new features: Remote indicating compass; flexible safety shield across the instrument panel to absorb body or head impacts in event of a crash; new landing gear shock absorber for smoother landings, and improved ventilation system to direct fresh air to any part of the cabin.

List price of the standard D50 is $77,000 fly-away factory; the 1956 C50 will cost $75,000.

Super 18

More than 30 new design and comfort features are listed for the 1956 Super 18 Twin Beech eight-place business transport. Redesigned interior provides for flexible seating arrangements or for cargo.

Changes include:

Redesigned cabin door with reinforced steps, mounting and new ring

FOUR-PLACE BONANZA G35 will be available only with 225-hp. Continental next year.

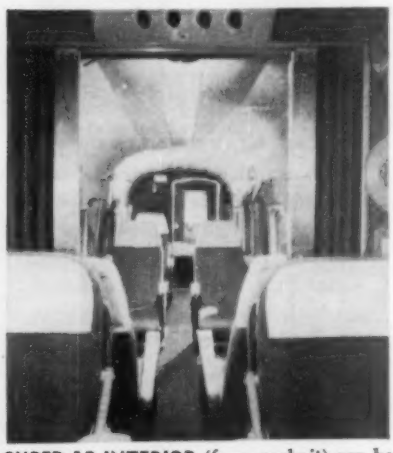
SUPER 18 TWIN BEECH features more than 30 design changes including new interior.

handle having positive locking action; revised generator system allowing generators to be turned on regardless of battery condition; new fuel-flow meter scale; redesigned brake line system to allow wheel removal without disconnecting brake lines; reinforced, heavier-gage metal in exhaust system; adjustable pilot's seat; improved defrosting system providing increased air flow, and a leaf table which folds into the cabin wall.

The basic Beech Super 18 sells for $98,975.

Four-Place Bonanza

The company has discontinued its 205-hp. Bonanza because of the demand for the 225-hp. model. The new G35 Bonanza cruises at 190 mph. at 75% power, or 184 mph. at 65% power.



SUPER 18 INTERIOR (from cockpit) can be revised quickly to permit cargo stowage.

Structural reinforcement is one of the features of G35, which also has the new instrument panel safety guards to cushion crash shock impacts. A new heating system is said to provide 20% more cabin warmth. Nosewheel shock strut has been redesigned to improve taxiing over rough terrain. An added feature is a electric temperature gage, for the engine, which is not affected by surrounding temperatures.

Offered as optional equipment are a thicker windshield and windows, plus thick fibrous-glass padding to reduce cabin noise levels further.

Basic price for the G35: $21,990.

Dealer Awards

Southern Airways Co., Atlanta, Ga., received a 1956 Cadillac for top sales of all Beech models and spares parts in 1955. Three domestic distributors each won $1,000 for turning in the largest percentage increase over their 1954 volume in a specific category.

- **Norman Larson,** Norman Larson Co., Van Nuys, Calif., for increased Bonanza sales.
- **W. B. Willis,** Alamo Aviation, Inc., San Antonio, Tex., Twin-Bonanza.
- **T. Gail Clark,** Tulsair Distributors, Inc., Tulsa, Okla., Super 18 sales.

Jack Marler, Beech western region sales manager, also received $1,000 for the largest territorial sales gain in 1955. Mark Kemp and Frank Kelsey, Kemp & Kelsey Airservice, Inc., Salt Lake City, Utah, received $500 for winning the spare parts sales competition.

New members of the "Million Dollar Club" for those exceeding $1 million in plane and spares sales during the year: Atlantic Aviation Corp., Teterboro, N. J. and Boston, Mass.; Atlantic Aviation Service, Wilmington, Del.; J. R. Gray Co., Dallas; Southern Airways Co.; Norman Larson Co.; Ohio Aviation Co., Vandalia; Tulsair Distributors; Alamo Aviation; Roscoe Turner Aeronautical Corp., Indianapolis; Cutter-Carr Flying Service, Inc., Albuquerque; J. D. Reed Co., Houston, and Oswaldo Lopez, Bogota, Colombia.

Private Plane Entry To Mexico Eased

The Mexican government has set up a special service to clear the entry of private planes to any point in the country, making unnecessary the repeated inspections of aircraft that have previously hampered U. S.-Latin American traffic.

A special radio network will clear planes in advance on the basis of flight plans filed at Rio Grande International Airport, Brownsville, Tex. An aviation travel service office at Brownsville will pass flyers through the field and take care of all arrangements and papers without charge.

Representatives of major flying associations in the U. S. and Mexico attended a meeting called by Brownsville Chamber of Commerce president F. W. Hughes, where the new service was announced.

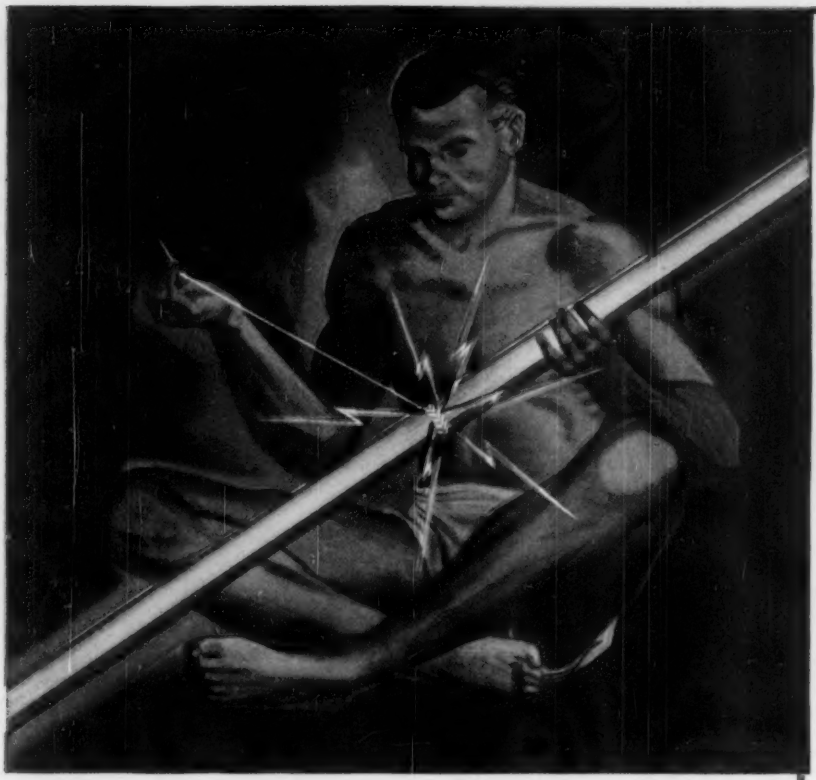
NBAA Begins Program On Operational Pitfalls

A broad program to educate top executives on the problems and pitfalls of business aircraft operations has been undertaken by the National Business Aircraft Assn.

In announcing the program, Henry W. Boggess, NBAA president explained, that many executives now feel that when they buy an airplane and hire a crew their flying problems are solved. In reality, Boggess said, they have just begun.

This education program will be undertaken during meetings of the National Business Aircraft Assn.'s executive advisory council, a group of top-drawer corporation people who will meet periodically to discuss corporate-flying problems. Aviation industry representatives will be invited to sit in on the discussions.

The council's initial meeting was held recently in New York. A second meeting is scheduled to be held in Washington during January. The group will include on the agenda a discussion of the association's dues structure. A new system may be developed, with dues proportional to the member's fleet and business flying activity.



SEWING STEEL TOGETHER with 4-million-volt stitches

Pieces of steel as large as railroad-car axles are being welded with speed and efficiency in the Cleveland Pneumatic plant.

The world's largest and most powerful general-purpose flash-butt electric-resistance welding machine is joining aircraft components now. This machine can butt-weld high-alloy steel pieces having a total cross-sectional area of as much as 67 inches. With low-carbon material, this area can be as large as 100 square inches.

A limited amount of this machine's extra time is now available on a contract basis to produce highest quality large-area welds on high-alloy steels at low unit costs.

Write for Booklet C-1255 which describes this machine and its capacities, and also tells you how our Contract Welding Department can be integrated with your production.

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Tool Company CLEVELAND 5, OHIO

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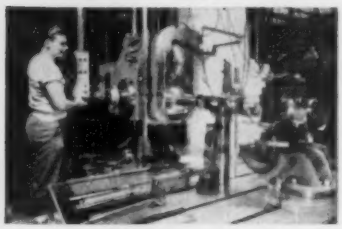
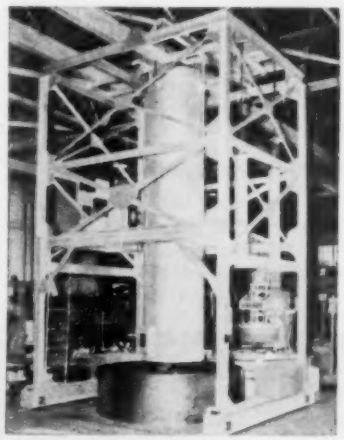


MACHINING

Your welding assemblies can also be given almost any machining or finishing that you require when they are contract-welded at Cleveland Pneumatic. Our modern machine shops include all types of turning lathes and machines, from giants that can turn columns 25 inches in diameter and 17 feet long to micro-precise thread grinders capable of producing any aircraft-quality threads on parts up to 13-inch-diameter.



HEAT-TREATING

A large and experienced heat-treating department can give your contract-welded parts the type of heat treatment that is required. Giant heat-treating furnaces and quench tanks 18 feet deep can handle alloy-steel parts up to 15 feet in length.

Cleveland Pneumatic Tool Co.
3781 East 77th Street • Cleveland 5, Ohio

AUSTER AIRCRAFT will make bid for New Zealand's agricultural market with its Agricola.

Auster Agricola Starts Flight Test

A bid for the New Zealand agricultural airplane market is being made by Auster Aircraft, Ltd., Rearsby, England, which has started flight tests of a new low-wing plane, the Auster Agricola (Latin: a farmer).

Its particular specialty is applying superphosphates and similar material from the air to the enrich the quantity and quality of grasslands, a vital factor in cattle-growing countries. New Zealand, which has done considerable pioneering work in aerial topdressing estimates that widespread use of this technique could increase its meat production by 50% in 10 years.

The new Agricola is designed for slow-speed, low altitude work and in-the-field maintenance using simple tools. The 240-hp. Continental engine has jet exhaust cooling to permit prolonged use of full power without engine overheating. High-lift wing design is aimed at getting the Agricola airborne in 250 yards with full load.

For ease of repair, construction is of steel tubing, fabric covered. Cockpit is placed high to provide maximum visibility, with the phosphate hopper placed beneath it to afford some protection in event of a crash. Instrument panel has foam-rubber padding as additional pilot protection.

The hopper is loaded behind the cockpit to ensure that no dust is blown into this area while the plane's engine is running. In an emergency, the pilot can dump his entire three-quarter ton of chemicals in five seconds, Auster reports. During ferry operations, an additional two passengers can be carried in the fuselage behind the hopper.

Interchangeability of parts is a key feature. Each landing gear leg and wheel can be fitted to either side; ailerons and elevators can also be interchanged.

To combat chemical corrosion, the entire rear of the fuselage behind the passenger compartment is sealed off and plastic paints and dopes are used for finishing. Control cables are outside the fuselage for easy inspection and they are nylon covered to resist chemical action.

Important dimensions for the Auster Agricola: Span, 42 ft.; length, 27.5 ft.; taildown height, 8.3 ft.; wing area, 254.7 sq. ft.; landing gear tread, 14.3 ft.; main wheel diameter, 22 in.; tail wheel diameter, 10 in. The fixed-pitch metal propeller has 7.5-ft. diameter.

PRIVATE LINES

Lockheed has no business aircraft projects on the drawing boards, nor does the company have any plans to enter this market, according to Hall Hibbard, vice president-engineering.

Over 100 automatic rudder controls have been shipped by Globe Industries, Inc., Dayton, Ohio. The company has a three-months backlog of orders for its gyro-stabilizer units, sales manager Sidney Gamsu, has told AVIATION WEEK. Installations are split fairly evenly between Piper and Cessna planes, he says. The gyro-stabilizer automatically corrects unwanted turns and permits making controlled stable turns using a knob control.

Sales of over $1.2 million in corporate aircraft have been made this year by On Mark Engineering Co., Burbank, Calif. Units comprised three DC-3s and four executive Douglas B-26s. Firm has main plant at Lockheed Air Terminal; has leased facilities recently at

HAWKINSON TREADS FOR AIRCRAFT TIRES

Serving Many of the Airlines in The United States, Canada and Foreign Countries

PRECISION Treading By the Exclusive Hawkinson Method

Authorized HAWKINSON TREAD Service

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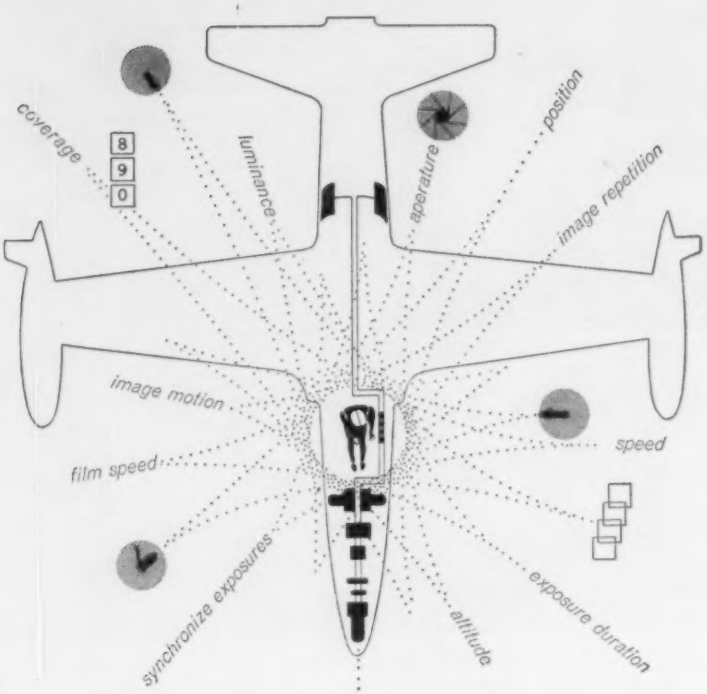
Jet age photo reconnaissance is a seemingly impossible one man job!



But... C.A.I. makes it easy as flicking a switch

In this day of supersonic speeds, piloting a plane is a full time job. Add the dozens of factors inherent in precision photography and you have an almost impossible situation! But Chicago Aerial Industries Photographic Control Systems change impossibility to simplicity . . . automatically obtaining, coordinating, synchronizing and computing myriads of these constantly changing factors to take technically exact pictures. This is the reason why America's newest recon jets rely on C.A.I. control systems . . . only one facet of Chicago Aerials advanced research and production in the fields of optics, mechanics and electronics.

The interesting, colorful C.A.I. brochure, "Advancing Horizons," will be sent to you upon request. Learn more about our advanced research and manufacture of aerial equipment—write for your copy today!

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1980 Hawthorne Avenue, Melrose Park, Illinois
Chicago office: 332 S. Michigan Avenue, Chicago 4, Illinois

Grand Central Aircraft Co., Glendale, to handle anticipated greater conversion business volume.

U. S. civil plane exports of aircraft weighing 6,000 lb. and under totaled 53 units valued at $646,416 during October, bringing to 541 the number of planes in this class exported so far this year. Total value was $6,534,085. Total exports in 1954 were 496 units valued at $7,123,071.

First French-built Widgeon converted to Super Widgeon configuration by McKinnon-Hickman Co., Portland, Ore., is being delivered to Reading (Pa.) Aviation Service for a customer. Seven of the former SCAN-30 amphibians built under license from Grumman have been imported into the U. S. by Welsch Aviation Co., N. Y., which has options on more of the planes. The five-seat SCAN-30 conversion costs $65,000, without radio; a new six-seat model is $1,000 additional. There are now 49 Super Widgeons in operation in the U. S. and Canada. Welsch reports that on its last biennial sales tour, it sold $310,000 worth of Widgeon conversions.

Weather radar for Twin-Beech and larger business planes is being developed by Weather Eye, Bridgeton, Mo. Target is a set weighing about 60 lb., with price "substantially" lower than current models.

New Camair 480 distributor is Southern Flight Service, Inc., Charlotte, N. C., which will sell the twin-engine Navion conversion in North and South Carolina.

Housing development for flying executives, built around a 3,200-ft. airstrip, will be undertaken next spring east of Spokane, Wash. Loren Lemen, operator of the strip, says that plans call for erection of 300 homes in the $12,000-$50,000 price range, with estimated cost of the development being $5.5 million. Construction of streets and airstrip has begun.

New DME service center, Qualitron, Inc., at Lockheed Air Terminal, Burbank, Calif., has been approved by National Aeronautical Corp., Ambler, Pa. Appointment brings to 19 the number of Narco-designated distance measuring equipment service facilities in the U. S. More than 200 Narco DMEs are now installed, mostly in business aircraft.

Custom Bell 47H-1 copter has been purchased by Roger Sherman Transfer Co., E. Hartford, Conn., hauling and rigging specialists, to expedite the firm's widespread operations.

New G-E Turbostarters give fast starts without ground power assistance

Sixty-pound unit produces more than enough horsepower to bring the engines of a USAF medium bomber to idle speed within 25 seconds—anywhere.

G.E.'s cartridge turbostarter makes the Martin B-57 one of the first USAF jet aircraft in production to be equipped with *self-contained* starting power. With this lightweight system, the planes can operate from the most advanced bases, even where ground support may not be readily available. At any base, instantaneous group take-offs are now possible without waiting for ground power—allowing the planes to be dispersed for maximum protection against air attack.

Speed and Reliability

According to E. G. Uhl, Martin's Vice President of Engineering, "The Martin Company has used General Electric cartridge starters since they were available. Thousands of starts have been accomplished successfully under all types of environmental conditions. This starter gives our Air Force the most rapid engine start available and frees ground crews from the burden of handling expensive, complex starting equipment."

Application to Any Aircraft

General Electric self-contained starters are designed to meet the needs of tomorrow's jet aircraft starting power, either military or commercial. In addition to the models now available, a 46-lb fuel/air turbostarter that is only 12½ inches long and will produce 10 ft-lb of torque for each pound of weight is in the works. This drive can be easily modified for your specific engine requirements and energy sources.

For further information on G-E turbostarters and other accessory drives, manufactured at the Aircraft Accessory Turbine Dept., West Lynn 3, Mass., contact your local G-E Apparatus Sales Office.

231-3

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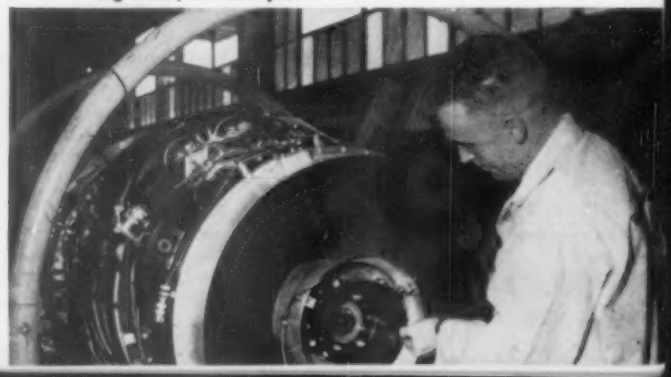
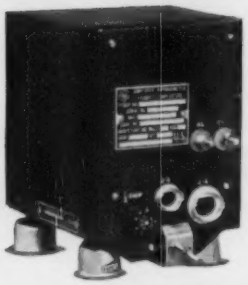
Only two airframe connections, electricity and exhaust, are required to mount the starter.

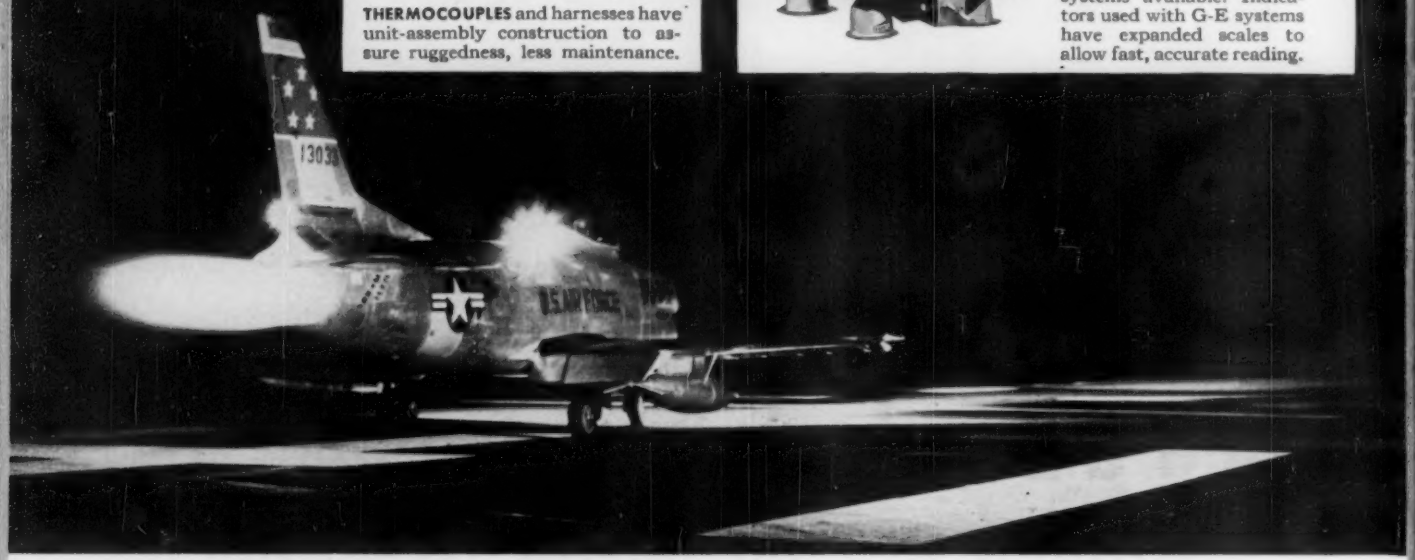
Integral quick attach-detach mechanism makes mounting a fast, one-man job.



THERMOCOUPLES and harnesses have unit-assembly construction to assure ruggedness, less maintenance.



SYSTEM is one of many types of G-E servo-temperature systems available. Indicators used with G-E systems have expanded scales to allow fast, accurate reading.



G.E. Offers Complete Systems Responsibility with a "Team" for Temperature Measurement

HIGH-ACCURACY THERMOCOUPLES AND SERVO-TEMPERATURE INDICATION SYSTEMS OFFER "SINGLE-SOURCE" ADVANTAGES FOR JET ENGINE APPLICATIONS

G-E THERMOCOUPLES, using stainless-steel harnesses and unit-assembly construction, assure long-lived reliability in jet exhaust-gas temperature measurement. Completely swaged magnesia thermocouple harness-and-lead assemblies can operate efficiently under extreme temperature and vibration conditions found in aircraft gas turbine applications. Life of typical G-E exhaust-gas temperature systems is 750 hours.

UNIT-ASSEMBLY CONSTRUCTION allows self-supporting harnesses to be installed easily. You simply tighten locknuts to bosses. Because separate connectors are eliminated, less maintenance is required. These outstanding features in low-cost G-E thermocouples can provide accurate, reliable temperature measurement for every jet engine application.

SEE FOR YOURSELF how General Electric exhaust-gas thermocouples will provide improved temperature measurement for your jet engine by ordering prototypes. G.E. is prepared to design and provide prototypes of any exhaust-gas thermocouple—without charge.

G-E SERVO-TEMPERATURE INDICATION SYSTEMS allow the use of easy-to-read repeater indicators. Expanded-scale type indicators have only one pointer instead of the usual two for more accurate reading. G-E repeater indicators are especially adaptable to the requirements of X-model aircraft where simultaneous readings on both pilot's panel and photo panel are desired. Systems can provide a signal for control initiation proportional to temperature, time over temperature indication, or for dual indicators. More accurate than millivoltmeter systems, G-E servo-temperature indication systems offer a high-accuracy way to temperature indication.

FOR FURTHER INFORMATION on the G-E thermocouple and servo-temperature indication system "team-mates" and how they can meet your temperature measurement problems, contact your nearest G-E Apparatus Sales Office or write Section 586-2, General Electric Company, Schenectady 5, N. Y.

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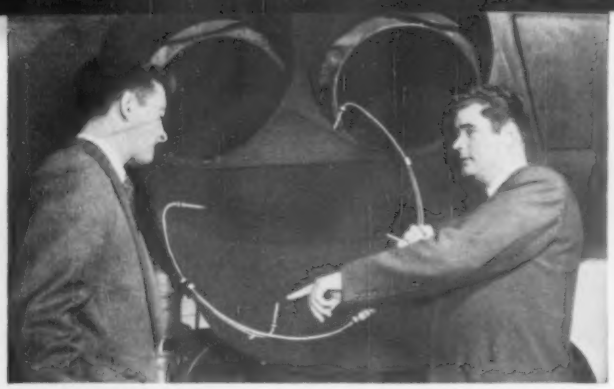
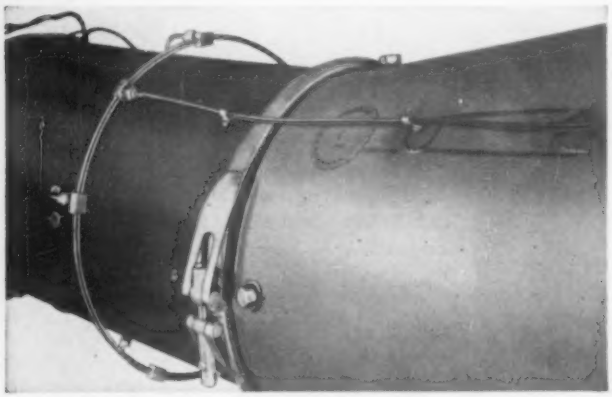


UNIT-ASSEMBLY thermocouples and harnesses weigh as little as 25 ounces, offer longer operating life. Swaged magnesia thermocouples and stainless-steel harnesses withstand high temperatures.



EASY TO INSTALL, G-E exhaust-gas thermocouples are self-supporting and require fewer connections, less maintenance than most other systems. To install each thermocouple, you tighten a simple locknut.

MORE THAN 8,000,000 HOURS flying time has been logged by Air Force Boeing B-47s using G-E jet engines equipped with G-E thermocouples. Over ten years' experience in production assures G-E exhaust-gas thermocouple accuracy, dependability, and long life.

IN ALL TYPES of aircraft, including fighters like the U.S. Marine Corps' North American FJ2, G-E thermocouples meet the demands of reliable performance in high ambient temperatures. Harnesses and leads can withstand acceleration hundreds of times that of gravity.

G.E. Offers a Complete Line of Instrumentation for Both Commercial and Military Aviation

ELECTRICAL QUANTITIES

- Voltmeters and Ammeters
- Frequency Meters
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- Transmitters
- Indicators

FUEL FLOW

- Transmitters
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- Power Supply

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- Directional Compass Systems
- Remote Compass Transmitters
- Gyros

LIQUID LEVEL

- Transmitters
- Indicators

TEMPERATURE

- Servo-indication Systems
- Thermocouple Assemblies
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COMPONENTS

- Position Elements
- Speed Elements
- Servo Motors
- Temperature Elements
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TRANSFORMERS FOR AIRCRAFT

For further information on any of the complete line of General Electric aircraft instruments, contact your nearest G-E Apparatus Sales Office or write Section 586-2, General Electric Company, Schenectady 5, N. Y.

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Just push a button...

25,000 POUNDS
OF COMBAT CARGO
SPOT-DROPS TO
ONE LOCATION

USAF HERCULES

The major problem in paradropping emergency supplies has been the unavoidably wide dispersal of small, individually-parachuted cargo units.

Tactical Air Command will lick this problem handily with the new Hercules C-130 transport built by Lockheed. This combat cargo carrier has the capacity to haul up to 25,000 pounds and paradrop it in a matter of *seconds*. Using the newest-developed aerial delivery techniques, this huge cargo load can be precision-dropped onto virtually any small space.

Powered by four Allison T56 turbo-prop engines, the Hercules is more than 19 times as productive as World War II twin-engine transports... and capable of flying cargo and men *farther, faster and at lower cost* than any other present-day combat transport. It's now being manufactured in quantity for the United States Air Force at

GOVERNMENT
AIRCRAFT PLANT NO. 6

LOCKHEED

AIRCRAFT CORPORATION

Georgia Division, Marietta

Israeli Report on Tragedy Over Bulgaria:

El Al Plane Shot Down Without Warning

A Constellation aircraft (Type 149), registered number 4X–AKC owned and operated by El Al Israel Airlines Ltd. flying on a scheduled passenger flight (Flight Number 402/26) from London to Tel-Aviv via Paris and Vienna, was shot down by Bulgarian fighters at about 0540 GMT on 27 July 1955.*

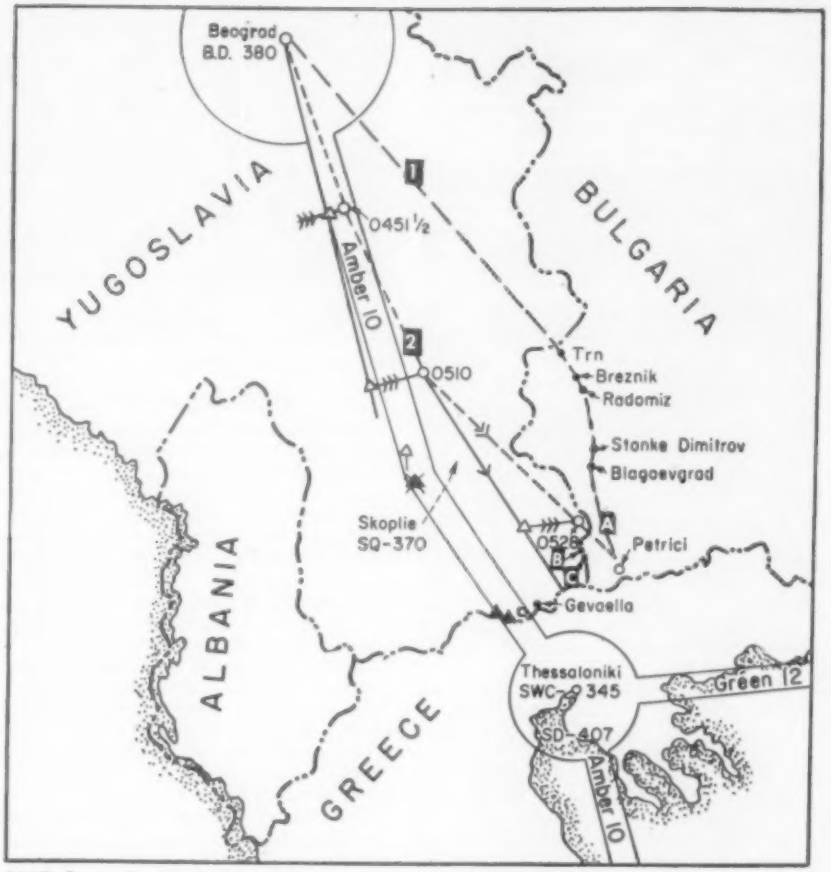
The aircraft broke up at an altitude of approximately 2,000 feet at a point 3½ kilometres southeast of the junction of the rivers Strumica and Strumon in Bulgarian territory near the Bulgarian-Greek border.

The aircraft had aboard 51 passengers and 7 crew members. There were no survivors.

At 0537 on 27 July, Athens Air Traffic Control received the following SOS on a ground-to-air frequency of 3481 kc/s: "SOS DE 4X–AKC." This message was relayed immediately by Athens ATC to Lod ATC. Athens Flight Information Centre declared an emergency and search and rescue services were alerted.

However, before search and rescue action could be taken, Athens ATC was informed that the aircraft had been observed falling in flames near the Greek-Bulgarian border near the Bulgarian village of Tserbanova, and passed the information to Lod ATC.

At 1200 on 27 July the Minister of Communications appointed this Commission of Inquiry to inquire into the disaster.



MAP drawn by Israeli investigating commission. Dotted line No. 1 shows Bulgarian's version of the transport's flight path. Line No. 2 is commission's flight-path fix.

Weather Conditions

The following report of forecast and actual weather conditions will be divided into three sections:

1. Weather on the Amber 10 Airway between Belgrade-Kraljevo-Skoplje and Gevgelia-Salonika.
2. Wind direction and velocity over the above route.
3. Weather over the South Bulgarian territory.

Sources of information:

(*a*) International synoptic station and area report as transmitted by Yugoslavia.

(*b*) Synoptic chart for area's actual weather at 0600 on 27 July 1955, including information on "last hour" observation and "past weather."

(*c*) 500 mlb. (18000 feet) actual wind chart, as confirmed by London, Lod Airport and Yugoslav Mea. authorities.

(*d*) JAT Pilot Captain Drakovic's report on a flight on the 27th at 1000 hrs. over the same route.

1. *Weather on Amber 10 between Belgrade and Kraljevo*

Broken clouds (average 3/8), 3/8 of Strato-Cumulus, 3/8 of Cumulus, cloud-base approx. 2000 feet, cloudtops about 8000 feet, temperature at 500 mlb. level (18000 feet) —11°C., visibility 10 km., but hazy due to after sunrise hour.

Kraljevo-Skoplje

Increasing cloud amounts (6-8/8). 3-5/8 Cumulus and Strato-Cumulus, base at 4000 feet, 3/8 of Alto-Cumulus base 9000 feet, *but considerable locally isolated build ups of Cumulus and Cumulonimbus reaching to 20-25000 feet with thunder, showers, lightning, icing and severe turbulence.*

Spread of these developed Cu and Cb's on west-easterly belt about 80 MILES WIDE and extending at least 100 MILES either side of Airway Amber 10.

These clouds have been reported as "past weather" (last three hours) and as "last hour" and "present weather" at 0600 hours. The international synoptic actual weather for South Yugoslavia and Northern Greece for 27th at 0500 hrs. reads: "Fair to cloudy, local overcast with thundery showers mainly to north."

Skoplje-Salonika

Weather cloudy to fair, rapid improvement of local cloudy conditions. 1/8 Cumulus at 4500 feet, 2/8 of Alto-Cumulus at 9000 feet. Visibility 10-25 km. Temperature at 18000 feet Minus 11°C.

2. *Upper Wind Direction and Velocity on Amber 10 Airway between Belgrade and Yugoslav-Greek Border*

The direction of the upper wind (18000 feet) was constant from 260-270° throughout the 300 MILES stretch.

At Belgrade and up to a point about 50 miles south, the velocity was as forecast about 20-25 knots. From then on, the wind increased sharply to a velocity of 70 knots, due to the development of a large "LOW" pressure area in the North and a "HIGH" pressure area in the South at 18000 feet level, after that decreasing from the Yugoslav-Greek border southwards.

International Synoptic Report for Upper Winds

South Yugoslavia and Northern Greece 27th 0500 hrs.

at 10000 feet	270°/35 knots
at 18000 feet	260°/70 knots

NOTE: JAT Pilot Drakovic flying same route at 0900 hrs. at 12500 feet reported wind of 270°/78 knots.

3. *Weather over South Bulgaria*

The weather was fine, traces of medium and high cloud. Visibility good. Wind as previous paragraph.

General Remarks

Of the weather as discussed above two factors are most relevant to this flight: Firstly, the presence of Cumulonimbus

*All times in this report are GMT.

clouds on the route, and secondly the sudden unpredicted change of the wind velocity from 20 to 70 knots.
(Meteorologists Charts Appendix. "H".)

CREW

1. The Captain of the aircraft was Mr. Stanley Reginald Hinks, born in 1920 at Diddywell, Devonshire, England. He was the holder of an Israel Airline Transport Pilot license No. 85 renewed 30 January 1955, valid to 30 July 1955, with rating for multi-engined land aircraft DC-4 and Constellation. His total flying experience was 9422 hours; 3199 hours were flown on Constellation aircraft of which 115 hours were flown during the last 3 months. Since March 1955, Captain Hinks had flown 6 flights on this route as captain.

Captain Hinks was the company's Flight Superintendent since March 1954, and surveyed this route together with the Chief Pilot when the company started to operate it in the summer of 1954.

2. The First Officer was Mr. Pinhas Ben Porat, born in Russia in 1914. He was the holder of an Israel Airline Transport Pilot license No. 77 renewed 30 April 1955, valid till 30 October 1955, with the ratings for C-46 and Constellation aircraft. His total flying experience was 4617 hours of which he had flown 1324 hours on Constellation. During the last 3 months he flew 187 hours on Constellation and 15 hours on C-46.

Mr. Ben Porat was a captain of the company on C-46 aircraft operating internationally and during this flight he was being checked out for company captaincy on Constellation.

3. The Flight Engineer was Mr. Cyril Sydney Chalmers, born in 1921 in Johannesburg, holder of an Israel Flight Engineer's license No. 61 renewed 31 May 1955, and valid till 31 May 1956. The rating of the license was on Constellation aircraft.

His total flying experience was 2147 flying hours of which 2047 were flown on Constellation aircraft. The hours flown during the last 3 months before the accident were 262.

4. The Wireless Operator was Mr. Raphael Goldman, born in 1929 in Berlin, the holder of an Israel Wireless Operator license No. 70 renewed on 30 March 1955, and valid till 30 March 1956.

His total flying experience was 1368 hours of which 805 hours were flown on Constellations. During the last 3 months he flew 205 hours on Constellations, and 40 on C-46. Recent captains' trip reports describe Mr. Goldman's performance as "above average".

5. The Senior Purser was Mr. Leon Tisser, born in 1922 in Dresden. He was employed in the company since 21 June 1950. The date of his last check on emergency procedures was 23 June 1955.

6. The trainee purser was Mr. Albert Alhadef, born in 1927 in Cairo. He was with the company since 5 July 1954.

7. The Hostess was Mrs. Sarah Acharkan, born in 1927 in Haifa, employed by the company since 1 June 1952. The date of her last check on emergency procedures was 8 December 1954.

The Commission is satisfied that all members of the Crew were properly licensed and qualified for this flight.

INVESTIGATION

The Commission immediately on appointment applied to the Bulgarian Legation in Tel-Aviv for visas to enter Bulgaria in order to proceed with the investigation on the spot. Furthermore, the Bulgarian Legation was approached by the Israel Foreign Ministry with the request that the Israel Commission of Inquiry act in conjunction with the Investigation Committee appointed by the Bulgarian Government in accordance with international practice.

The answer to the application for visas was that the matter had been referred to Sofia with the request that visas be issued by the Bulgarian Legation in Athens in order to save time. No answer was received to the request to participate in a joint investigation.

The Commission immediately on arrival at Athens approached the Bulgarian Legation which had not yet received instructions to issue the necessary visas. The approach was made through the Israel Legation in Athens. The Bulgarian Legation agreed to endeavour to arrange for visas to be issued at the frontier. Again in order to save time, the Commission proceeded to a Greek border village named Kula 14 kilometres from the site of the wreckage.

The Commission remained at Kula waiting for permission to cross into Bulgaria. During this time it interviewed and took the testimony of a number of Greek eye witnesses who were stationed at border posts. Of these witnesses three were Greek military personnel stationed at the point marked 'O' on the attached map.

This point is at an altitude of about 1400 metres overlooking the valley of the Strumica. Three witnesses, also Greek military personnel, were stationed at points on high ground with an unobstructed view of the valley. One witness was a civilian. The last witness was a Greek officer who had collected evidence from various posts.

Throughout the two days (28 and 29 July) the Commission spent on the border awaiting permission to enter, it was able to observe portions of the wreckage and the activity on the site. The activity was considerable. Trucks were seen moving around in the area and wreckage was being transported to places out of view.

The work of the Commission during this part of the investigation was greatly facilitated by the sympathetic attitude and willing cooperation of the Greek authorities.

Permission was eventually granted to enter Bulgaria on 30 July, but the number of persons was limited to three and they were obliged to return before sunset.

As arrangements for the crossing of the border were not completed until 1100 hours, the total time allowed in Bulgaria was only 7 hours, including transportation to and from the site of the wreckage. During this time, however, the team was able to take a large number of photographs and make detailed notes of the condition of the wreckage. They were accompanied by Mr. Molerov, representing the Bulgarian Foreign Ministry, by Mr. Nall, the Israel Chargé d'Affaires at Sofia and by Mr. Nir of the Israel Legation at Sofia. Colonel Stevenson, the British Military Attaché at Sofia, was also present.

The team found: [1. That many parts of the aircraft had been removed from the places where they originally fell. [2. That a most thorough search had been made of the wreckage. Lining had been ripped off and all closed structures had been opened for examination. [3. That there were holes of various calibres too numerous to detail in the short time available. [4. That all traces of bodies, luggage and personal belongings had been removed. [5. That nearly all cockpit equipment, such as radios, instruments, electrical panels, had been removed and were not available for examination. Only one radio compass indicator and some completely smashed radio sets were found.

Before leaving Bulgaria the team requested permission to interview witnesses who could give further information. They requested particularly to see the pilots of the jet fighters who were obviously the only witnesses to give full and detailed information as to what had happened.

They further requested permission to interview the Commanding Officer who had ordered the fighters to take off and, in

EMPENNAGE GROUP. When Israeli commission arrived, deicer boots had been cut open.

REAR PRESSURE BULKHEAD of El Al Israel Constellation had been sprayed by bullets.

addition, persons along the flight path.

They also asked for the return of aircraft parts that had been removed from the site. Mr. Molerov's response to this request was that it would be referred to the authorities at Sofia.

Unfortunately, no answer has been received to these requests up to the present and the Commission has been obliged to prepare this report without this vital evidence being available from Bulgaria. The only Bulgarian evidence is the official communiqué of the findings of the Bulgarian Investigation Committee which established beyond any doubt that the aircraft was attacked and brought down by Bulgarian fighters.

The Commission next sought permission to enter Yugoslavia in order to gather evidence there. Visas were duly granted by the Yugoslav authorities at Salonika and at 1400 hours on 2nd August, four members of the Commission crossed the Greek-Yugoslav border at Gevgelia. They were assisted in their work by civilian and military representatives of the Yugoslav Republic.

The witnesses interviewed by the Commission were all military personnel who had been stationed at points along the Yugoslav-Bulgarian border. Three of the witnesses had made their observations from a post marked "A" on the map, situated 48 kilometres north of the Greek border. Another two witnesses were stationed at the post marked "B", 20 kilometres north of the Greek border. One further witness was stationed at the point "C," 18 kilometres north of the Greek border.

One member of the Commission visited Skoplje and Belgrade aerodromes and gathered information from the Civil Aviation authorities. He also interviewed the Flight Control Officer who had been on duty at the time the aircraft passed over Belgrade and a JAT Airlines Captain who had flown the Airway Amber 10 on the morning of 27th July.

AIDS TO NAVIGATION

(a) *Aids Available on this Flight*

The aircraft reported over Belgrade at 0433. Belgrade has the following navigational aids: Two non-directional beacons with call signs BD and ZN. The aircraft used the BD beacon in its flight plan and when reporting. Both beacons were, at this time and date, serviceable. The BD beacon has an aerial output of 1500 Watt. In addition to these two beacons, Belgrade has a VOR which was working normally.

The next reporting point Kraljevo has no navigational aid.

The reporting point at Skoplje, where Airway Amber 10 changes its direction from 161° (magnetic) to 142° (magnetic), is equipped with a non-directional beacon with an aerial output of 1200 Watt. This beacon was working normally at the time of the flight. Between Belgrade and Skoplje, a distance of 177 nautical miles, no other radio aid is available either on the airway or abeam of it.

The reporting point at the Yugoslav-Greek border is the town of Gevgelia. There is no navigational facility whatever at this point.

The next navigational aid is a 350 Watt non-directional beacon at Salonika. There is, therefore, a further distance of 107 nautical miles between Skoplje and Salonika without any intermediate navigational aid. It should be mentioned in addition that according to information received from a Pan American Airways flight using the Salonika beacon at this time, reliable reception was limited to a small area over the beacon.

(b) *Airborne Navigation Equipment*

The Constellation 4X-AKC was fitted with two serviceable radio compasses (Bendix), each radio compass being an independent unit from the indicator to the loop and sense aerial. There were also two independent VOR units (Bendix) installed in the aircraft. There were, in addition, one magnetic compass and one Flux-gate compass. These had been swung and adjusted on 18 May 1955. Both pilot positions were equipped with full instrument panels, including three directional gyros. There were also two U. S. installations with 75 Mc/s Marker receivers. One Radar altimeter and a

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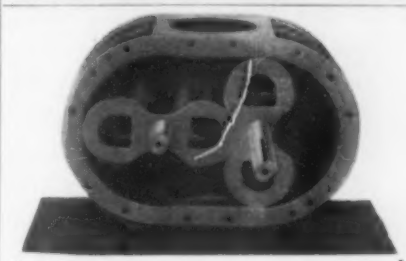

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(c) *Aids Used and their Effectiveness*

It is assumed that when within range of the BD beacon and the VOR at Belgrade, these aids were used. The VOR was, no doubt, helpful in keeping the aircraft in the airway for the first part of its flight from Belgrade towards Skoplje.

The range of the VOR should not be considered reliable beyond 70-80 nautical miles.

The range of the BD beacon owing to thunderstorms could not have been considered reliable for steady course indication. This applies, and even to a greater extent, to the Skoplje beacon which was surrounded by static.

The Salonika beacon due to its low output and the possibility of coastal refraction would not have been reliable. It should be noted that the effectiveness of all three nondirectional beacons may have been reduced by sunrise conditions.

GROUND TO AIR COMMUNICATIONS

Time	*Message*
0314	YUD from 4XAKC—Air Traffic Control Belgrade—4XAKC I departed from Vienna at 0253 am cleared to and estimate arrival at Lod at 0910 am maintaining 17500 feet estimate Flight Information Center Yube at 0328
	4XAKC from YUD Right, am acknowledging receipt YUD from 4XAKC SRI I am being interfered with.
	I have nothing for you.
0316	4XAKC from YUD Right, acknowledging, out.
0317	YUD from 4XAKC Right, thanks.
0407	BE from Elal 402 over "SB" beacon at 0407 at 17,500 feet estimate over "BD" beacon at 0432.
0407	BE Right, acknowledge.
0433	BE from Elal 402 over "BD" beacon at 0433 at 17,500 feet estimate over Kraljevo at 0449 estimate "SQ" (Skoplje) at 0517.
	BE, Right acknowledge.
0512	unreadable from 4-KC.
0513	YUD from 4XAKC "SQ" beacon at 0510 altitude 17,500 feet estimate Gevgelia at 0528.
	4XAKC from YUD Right, acknowledge please advise border at 0528.
0515	YUD from 4XAKC Right OK will call you again at border.
0528	YUD from 4-KC I passed border at an altitude 18,000 am changing transmission to Athens Goodbye.
0528	4-KC from YUD Right, confirm border at 0528 Goodbye.
0528	YUD from 4-KC Right Goodbye out.
0537	SOS from 4XAKC.

FLIGHT RECONSTRUCTION

(a) *London to Belgrade.*

The Flight started from London at 2015 hours on 26 July. A landing was made at Paris and then at Vienna. The aircraft left Vienna at 0253 hours on 27 July. According to the flight plan filed at Vienna, its estimated time of arrival over Belgrade was 1 hr. 43 min. after

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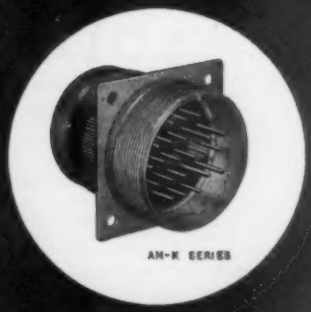
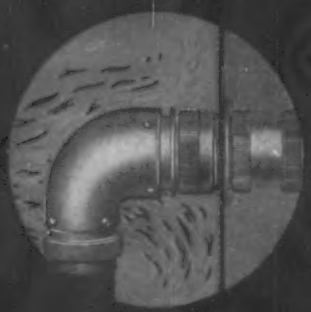


AN-K SERIES



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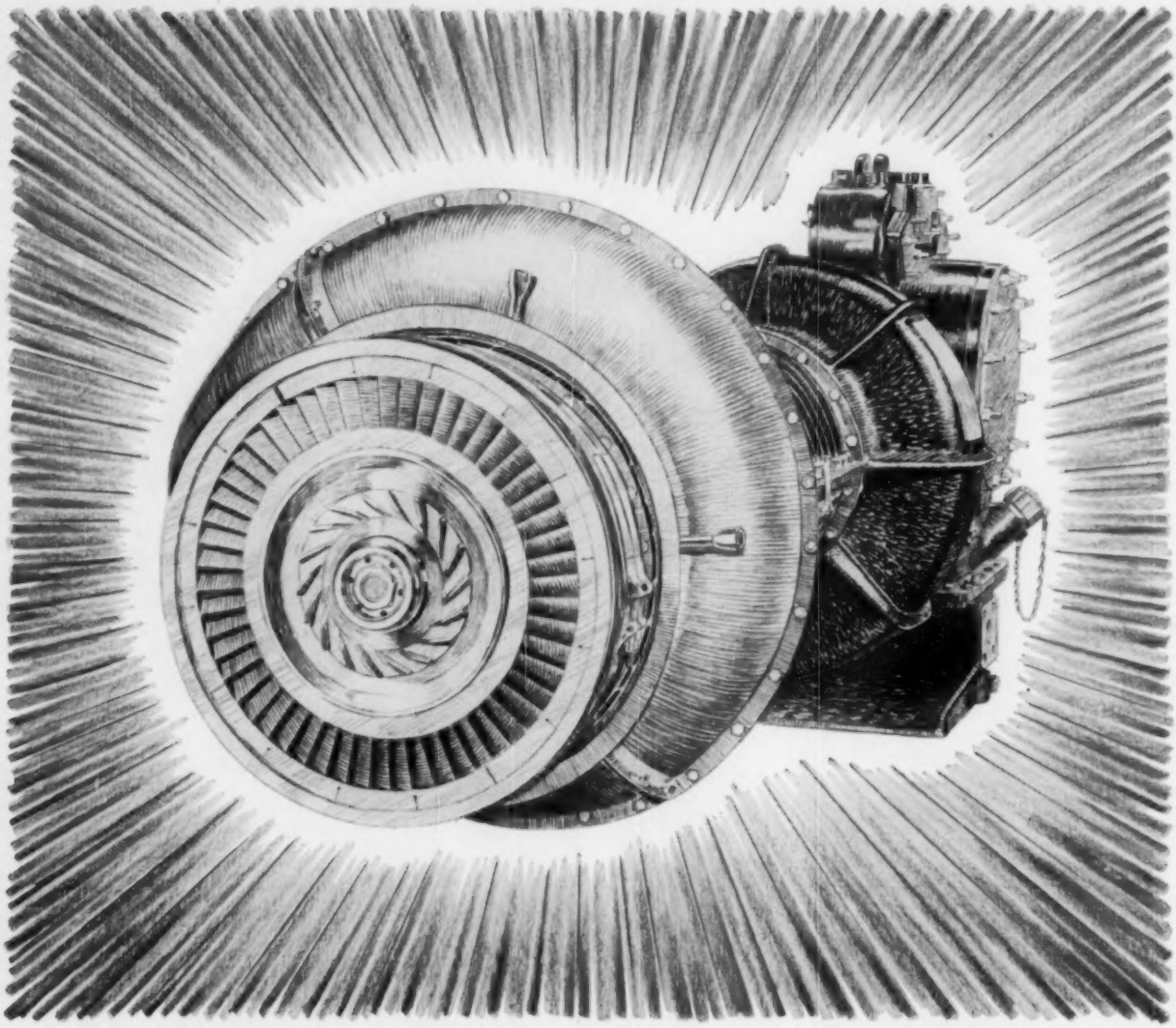

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take-off, that is to say at 0436. In fact, it reported over Belgrade at 0433.

There is no doubt that, when the aircraft reportel over Belgrade, it was, in fact, over the reported position. This was confirmed by the Control Officer at Belgrade who stated that he had heard the aircraft overhead at the time of its report. The radio facilities at Belgrade described earlier and the airborne equipment available would ensure that the aircraft could not be off course at this point.

(*b*) *Belgrade to Point 0510 (Vicinity Skoplje)*

From Belgrade the aircraft heading would be along the Airway Amber 10, that is to say on a magnetic course of 161°. The winds forecast for this part of the route and used in the flight plan were 270°/20 knots at an altitude of 18000 feet. The altitude for which the aircraft was cleared was 17500 feet.

The wind as forecast required a correction of 4° to the right, giving a heading of 165°. This was the heading used in the flight plan.

The time for the leg Belgrade-Skoplje calculated in the flight plan was 44 minutes. The planned arrival over Skoplje was, therefore, 0517. The actual reporting time over Skoplje was given as 0510, that is to say 37 minutes elapsed between the report over Belgrade and the report over Skoplje. The wind for the first half of this leg was, in fact, as forecast.

Wind Increases

Plotting the aircraft's position after completion of the first half (70 nautical miles) of the leg on the basis of an indicated air-speed of 200 statute miles per hour at an altitude of 17500 feet with an outside temperature of —11°C., which gives a true air-speed of 230 knots, we arrive at the point marked 04514 on the attached map (page 51).

From this point on the winds actually encountered were 260°/70 knots. The winds forecast, it will be remembered, were 270°/20 knots. The pilots could not have been aware of the wind increase and would not, therefore, have made any correction to the course. The aircraft must, therefore, have continued on the same bearing as before (165°) until reporting over Skoplje. This report was made at 0510. At this time the aircraft would, in fact, have left the airway and arrived at the point marked 0510 on the attached map.

The premature report over Skoplje beacon was probably due to an erroneous indication of the radio compass influenced by the thunderstorms which were well developed near the actual flight path (see meteorological map attached). It should also be noted that the easterly trend of the flight path could not have been checked by air to ground observations owing to the fact that the aircraft was passing over clouds.

In the section of this report dealing with the weather it was noted that from Kraljevo to south of Skoplje there were considerable build-ups and isolated Cumulonimbus reaching great heights with lightning, icing and severe turbulence.

Encountering these conditions, the

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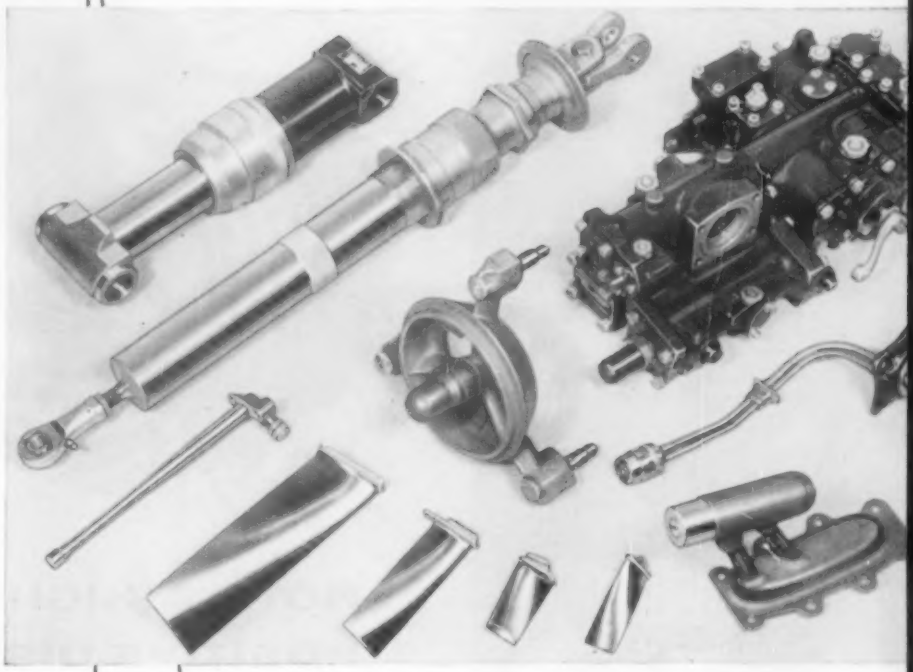

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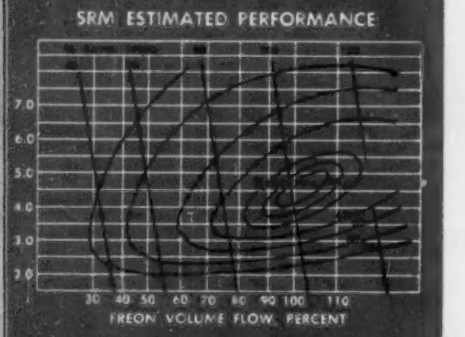
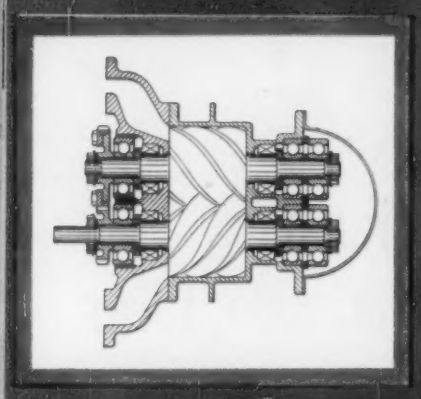
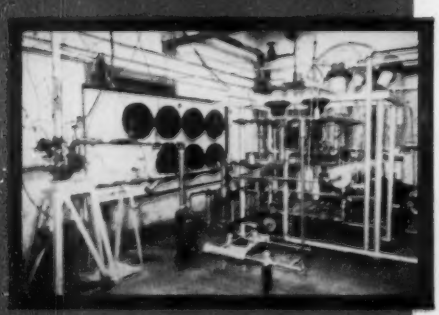


Performance Map Shows Compressor's Efficiency



Cutaway View Showing Compression Principle



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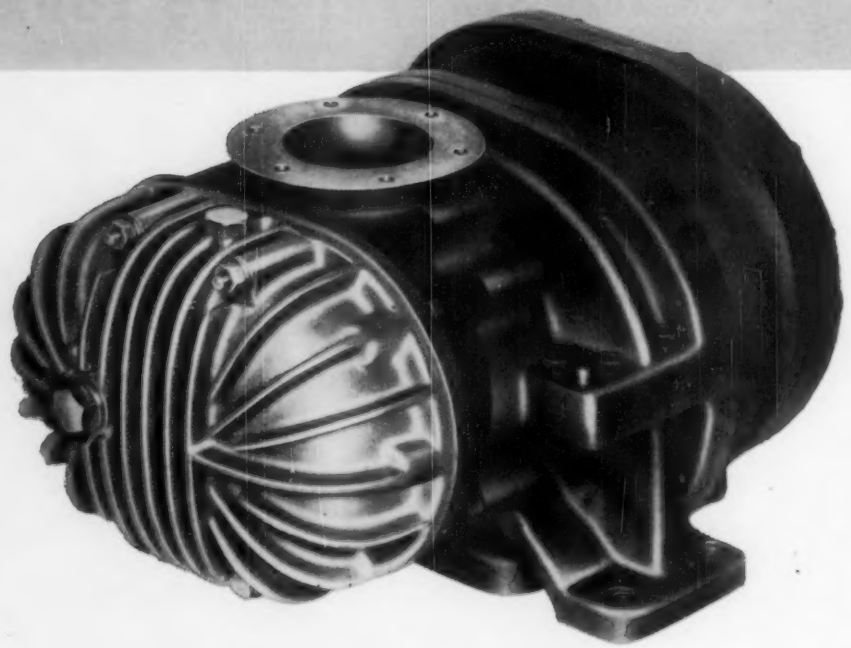

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pilots would, as a matter of ordinary airline practice, make small detours wherever possible, to avoid passenger discomfort. In reconstructing the flight path, we have, of course, not been able to reflect slight variations of course due to such detours but these should be borne in mind in evaluating the accuracy of the reconstruction.

(c) *Vicinity Skoplje (Point 0510) to Vicinity Yugoslav-Bulgarian Border (Point 0528)*

Assuming they were at Skoplje beacon, the pilots at 0510 altered course to the new heading of the airway, namely 142° corrected for the forecast winds to 146°. They steered this course for 18 min. before reporting over the border at 0528.

Plotting the course taken during the 18 minutes with allowance for the actual wind, we arrive at the point marked 0528 on the map. We conclude this was the aircraft's actual position when it reported over the Yugoslav-Greek border. It was, in fact, close to the Yugoslav-Bulgarian border at a point approximately 26 nautical miles north of the Greek border.

Over Bulgaria

Continuing on this course for a further few minutes, the aircraft would cross into Bulgarian territory.

The place of this crossing corresponds to the position where the Yugoslav eyewitnesses observed the aircraft.

At this stage we feel obliged to refer to the findings of the Bulgarian Investigation Committee which were to the effect that the aircraft entered Bulgaria at the town of TRN and after penetrating Bulgarian air space for 40 kms. turned south and flew over various Bulgarian towns. South of the town of Stanke Dimitrov the plane was intercepted by two Bulgarian fighters which warned it to land. Having regard to the fact that the town of TRN is on a bearing of 135° (magnetic) from Belgrade and at a distance of 147 nautical miles from it, such a course is quite unrelated to the pilots' flight plan or to the direction in which they were making.

The winds in this region were as predicted. The pilots were assisted for 70 miles out of Belgrade by reliable track indicating navigational aids (VOR). They were experienced pilots familiar with the route.

We are satisfied that they could not have flown for some 41 minutes on an entirely arbitrary course, then turned sharply south on an entirely new course without apparent reason, and therefore reported without comment over the Greek border.

It is stated in the above findings that the fighters warned the aircraft to land "in conformity with established international regulations. In spite of this it would not obey and continued in its flight towards the south in trying to escape."

It is inconceivable that an unarmed civil aircraft with an experienced crew having 51 passengers aboard would not obey orders adequately given by two armed fighters.

Further, the subsequent behaviour of the fighters is inconsistent with any previous warning having been given. The

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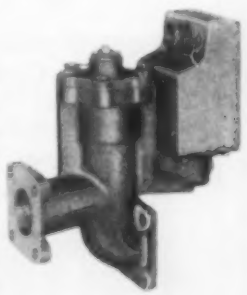

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fighters attacked the aircraft a second time when it had lost considerable height and was evidently seeking for a place to land. A last attack was carried out at a time when the course of the aircraft was northward heading further into Bulgarian territory; the aircraft had already been hit and was obviously making an approach for a forced landing either in the Strumon valley or on an abandoned airfield further north.

Finally, no radio warnings on the frequency fixed by the International Civil Aviation Organization for aircraft communication in this region were intercepted by either Greek or Yugloslav aeronautical stations keeping watch.

Dispute Bulgar's Finding

The Commission, therefore, after careful consideration cannot accept the findings on this point as set out in the official Bulgarian Communiqué.

(*d*) *Eye Witnesses on the Borders*

The Yugoslav witnesses, it will be remembered, made their observations from points along the Yugoslav-Bulgarian border.

One of the three witnesses stationed at the point marked "A" on the map saw a large aircraft flying in a south-easterly direction over Bulgaria and two fighters approaching it from the east. One of the fighters took up a position between the large aircraft and the Yugoslav-Bulgarian border. The other fighter manoeuvred around the large aircraft. All three witnesses at the point "A" heard bursts of machine gun fire but none of them saw signs of a hit.

The two witnesses stationed at the point marked "B" on the map heard an aircraft to the north-east of their position and heard bursts of machine-gun fire. They then observed the aircraft moving in a south-easterly direction towards the Greek border. After this they heard more machine-gun fire. The aircraft was flying in a south-easterly direction and was about 7 kilometres distant from the observation post when it disappeared from view.

A witness stationed at the point marked "C" on the map also saw the aircraft to the north-east of his position and observed it flying to the south-east and losing height. He heard machine-gun fire but did not observe fighters or smoke from the plane when it disappeared over the mountain marked on the map with its coordinates 41°28'N 23°05'E.

The Kill

The next witnesses to see the aircraft were the Greek observers along the Greek-Bulgarian border. The first group of observers (three witnesses) stationed at the point marked "O" on the map saw the aircraft approach over the mountain (41°28'N23°05'E) from the north-west. When it appeared, smoke was coming from its right side.

Before the aircraft came into view one witness heard what he took to be heavy gun fire and another what he thought was thunder. The aircraft was seen flying south-east losing height but under control.

South of Petrici the aircraft started to turn towards the north-east, heading for the plain north of hills 224 and 281. A little beyond this to the north there is an abandoned military airfield. All three witnesses at this post state that when the aircraft was over hills 224 and 281, it broke up and fell in pieces. Part of the debris fell on the north-western slopes of the hills and burned for a short time. The other part fell on the south-eastern slopes and continued burning for more than an hour.

When the aircraft broke up in midair, it was at an altitude of approximately 2000 feet.

Other witnesses stationed at points further east along the same border heard machine-gun fire before the aircraft appeared and then saw it coming low over the mountain with fire and smoke at the root of the right wing.

They generally confirmed the previous witnesses regarding the path the aircraft took. However, they saw, in addition, two jet fighters above the aircraft. One of the jets disappeared immediately after the aircraft turned north but the other accompanied it right up to the time when it broke up. After this it circled and flew to the north. These witnesses heard a loud explosion at the time the aircraft broke up.

Three other witnesses, civilians, made their observations from the vicinity of Promachonos. One of them heard shots immediately before the aircraft broke up. The attention of the others was drawn to the aircraft by what they described as "noise". Of this group of witnesses two saw the fighter.

Efforts were made to obtain exact information from the witnesses regarding times. However, as all estimates appeared completely unreliable on cross-examination, it has not been possible to place reliance on this type of information.

(*e*) *Vicinity Yugoslav-Bulgarian Border (Point 0528) to Break-Up*

In the light of the evidence of the eyewitnesses, both Yugoslav and Greek, the reconstruction of the flight path may now be continued from the point 0528.

Pressure Loss

As mentioned before, the aircraft may be presumed to have continued to the Yugoslav-Bulgarian border without altering course. The distance from the point 0528 to the mountain (41°28'N 23°05'E) over which it first appeared to the Greek eyewitnesses is 17 nautical miles.

The mountain is about 6000 feet high and the aircraft was described as coming low over it. We assume, therefore, an altitude of some 8000 feet.

As the aircraft had reported at 18000 feet over the point 0528, it must have lost approximately 10000 feet of altitude over a distance of 17 nautical miles. This means that the aircraft must have reduced speed to the minimum in order to make a rapid descent. It must have averaged about 150 knots over this distance which it would then have covered in 7 minutes, bringing it over the mountain at 0536.

Loss of pressurization as a result of

damage to the fuselage caused by one of the earlier bursts of fire may account for the very rapid descent. (It will be remembered that the Yugoslav witnesses heard machine-gun fire before the aircraft came into view.

As the Yugoslav witnesses heard fire when the aircraft disappeared from view and the Greek witnesses heard fire just before the aircraft appeared smoking into their view, it seems that the aircraft was hit for a second time and a fire started as the aircraft came over the mountain.

The SOS message was received at 0537 which would be immediately after the fire started.

Why no SOS message was received earlier is a matter for conjecture. The cause of the sudden loss of pressurization may not have been immediately apparent to the captain: his first action would have been to lose height as rapidly as possible; at the same time he would have tried to find out the cause of the loss of pressurization. It may be that it was only at the second attack that he realized that the aircraft was under fire.

The aircraft continued on towards Petrici accompanied by the two fighters. It was losing height steadily. After crossing the Strumica river, it turned left between Petrici and the Greek border. It then headed in a northerly direction towards the Strumon valley until it reached the hills 224 and 281.

Right up to this point the aircraft appears to have been under control and the pilot was making for a landing on the Strumon plain and possibly on the abandoned military airfield north of the hills. One of the fighters accompanied the aircraft to the end.

From the report on the wreckage and technical investigation it can be seen that certain damage was inflicted in the air immediately before the break-up.

Explosions of large calibre projectiles in the rear part of the fuselage damaging the control mechanism of the elevators and rudders would not have permitted the aircraft to maintain controlled flight.

Wing Explodes

Furthermore, projectiles had penetrated the tanks of the right wing and it was clear from the scatter of the pieces that the wing had exploded in mid-air. The left wing tanks had also been hit by bullets which must have started a fire followed by an explosion.

The technical investigation points to the aircraft having exploded and broken up over the hills as the result of a final attack. The eye-witnesses' evidence supports this conclusion. Nearly all of them saw the aircraft break up in mid-air and some saw a fighter accompanying it. The witnesses to the west and south of the hills did not hear either the explosion or gun-fire. Those a little further to the east along the frontier heard the explosion and some of them also heard gun-fire.

The failure of some of the witnesses to hear the sounds of the explosion and gun-fire may be due to the strong westerly wind which was blowing at the time.

From the condition of the wreckage and the eye-witnesses' description of the break-up of the aircraft in mid-air to-

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gether with the statement of the Bulgarian Government, it may be conclusively presumed that there were no survivors.

CONCLUSIONS

1. On the 27th of July, 1955, at approximately 0540 GMT, a Constellation aircraft of Israel civil registration (4X–AKC), en route from Vienna to Lod, was fired upon in three phases by two Bulgarian jet fighters and in the last attack was destroyed over Bulgarian territory.

   The first firing took place in the area of the Yugoslav-Bulgarian border at an altitude of approximately 18000 feet. The Commission is satisfied that the aircraft did not receive any warning prior to this firing.

   Several minutes later the second firing took place over Bulgarian territory at an altitude of approximately 8000 feet. The aircraft was then evidently in process of descent seeking a place to land and was showing signs of fire. Nevertheless it continued in controlled flight. At the time of this attack it had covered some 17 nautical miles within Bulgarian air space.

   After approximately five minutes the third attack took place at an altitude of about 2000 feet. The aircraft was still under control, heading northward deeper into Bulgaria and making for a forced landing. As a result of this last attack, the aircraft broke up in mid-air.
2. The aircraft entered Bulgarian air space being approximately 35 nautical miles off track on a course which would have brought it to the Bulgarian-Greek border after traversing approximately 26 nautical miles (6 to 7 minutes flying) of the south-western corner of Bulgaria. The Bulgarian statement as to the course and track of the aircraft is inconsistent with the facts as proved.
3. In the circumstances of wind and weather on this flight, the crew could not have been aware of the aircraft's drift from track (see para. 2 hereof). In any event, the cause of the disaster was not this deviation but the action of the Bulgarian fighters in shooting down the aircraft.
4. There were no survivors.

RECOMMENDATIONS

1. Throughout the European and Middle East regions there are a number of airways which are not adequately equipped with radio navigational aids ensuring that pilots are given a reliable tracking when they need it most, that is to say, in bad weather.

   Non-directional beacons are inadequate aids unless supplemented by other navigational aids such as radar surveillance of the kind provided, for example, in England. With NDB's alone pilots will be unable to avoid deviations from the airways.

   The International Civil Aviation Organization has recommended a more extensive use of VOR's which not only give an adequate track but are also unaffected by bad weather (static).

   The route Belgrade–Salonika (Airway Amber 10) over a distance of 284 nautical miles is equipped with only one VOR (at Belgrade) and 3 NDB's (at Belgrade, Skoplje and Salonika) but has five compulsory reporting points (Belgrade, Kral-

jevo, Skoplje, Gevgelia and Salonika).

In practice, the Airway Amber 10, when flown from Belgrade in bad weather, can be followed with accuracy only for the first 70 miles with the aid of the Belgrade VOR.

It is, therefore, recommended that:

(a) Navigational aids which are not affected by static should be introducel along Airway Amber 10 to supplement the present NDB's and should cover the whole Airway.

(b) All compulsory reporting points should be equipped with radio navigational aids.

2. As far as the Commission is aware, no communication watch on ground to air frequencies, used by aircraft on this route, is kept by the Bulgarian communication centres nor are they obliged to keep such a watch.

It is, therefore, recommended that:

(a) A continuous watch be maintained on appropriate ground to air frequencies by those governments which have established prohibited areas in proximity of international airways.

(b) There is also need for a standard air to air code of visual signals in the absence of radio communications and or a common language.

3. Finally, the Commission is of the opinion that there is urgent need for coordinated international action to prevent the shooting down of civil aircraft.

The Commission, therefore, recommends to the Government to examine what steps may be taken to this end through the UN, ICAO and otherwise.

Tel-Aviv, 18 August 1955.

(Signed)

Emanuel Zurr
Chairman of the Commission of Inquiry
Mordechai Max Laufer
Member of the Commission of Inquiry
Joel Palgi
Member of the Commission of Inquiry
Zivi Tohar
Member of the Commission of Inquiry
Asher Vogel
Member of the Commission of Inquiry
Michael Shlomo Englard
Member of the Commission of Inquiry

BULGARIAN NOTE OF AUG. 4, 1955

The Minister of Foreign Affairs of the People's Republic of Bulgaria presents its compliments to the Israeli Legation at Sofia and in response to its note No. V/0485/02 of July 29, 1955, under orders from its Government, has the honor to make known the following:

From an inquest conducted by the Special Governmental Commission, the following has been established in an incontestable manner:

On the 27th of July of this year at 7:10 a.m. local time, an airplane of the Israeli urline company "El-Al" penetrated Bulgarian air space in the region of the town of Trn without any preadvice. After having penetrated to a depth of approximately 40 kilometers, the airplane overflew the towns of Breznik, Radomir, Stanke-Dimitrov and Blagoevgrad and continued south. The airplane flew over approximately 200 kilometers of Bulgarian territory.

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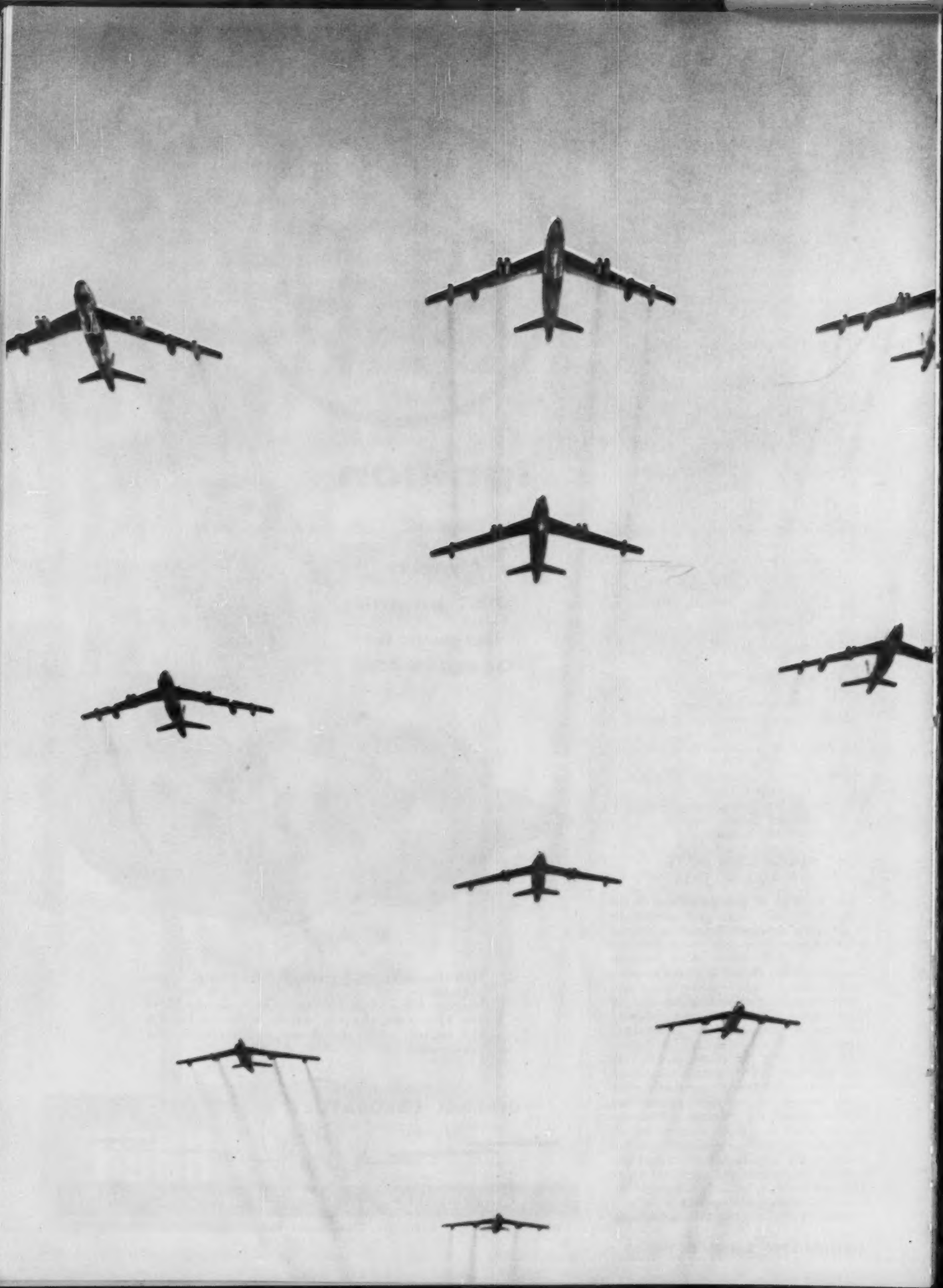

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- **Still more advanced G-E powerplants**—including rocket and atomic—are in early development phases. And General Electric is backing its development programs with a multi-million dollar investment in new facilities, studies in advanced propulsion principles, and the development of new components and accessories.

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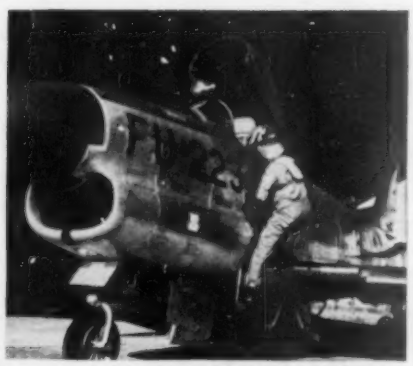

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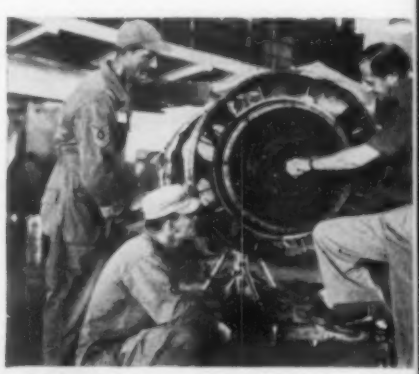
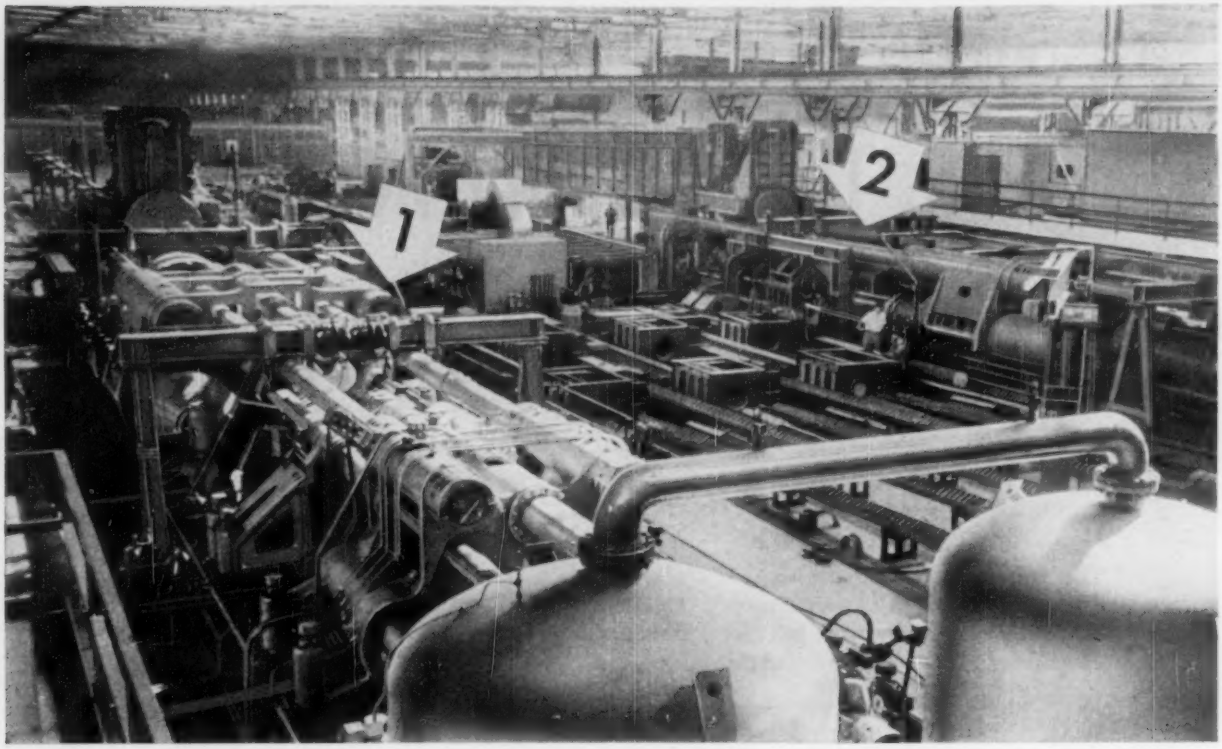


IMPROVED MAINTENANCE of J47's in recent years has paid off in better G-E jet performance for U. S. Air Force. Joint effort of G-E tech reps and USAF training personnel is playing vital role.



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the plane was intercepted by two Bulgarian fighters which had been ordered to force the plane to land at some Bulgarian airport.

The fighters warned the airplane, in conformity with established international regulations, to land. In spite of this, the airplane did not obey but continued to fly south, trying to flee across the Bulgarian-Greek border.

Under these circumstances, the two fighters, belonging to the Bulgarian Anti-Aircraft Defense Forces in this region, astonished by the conduct of the airplane, opened fire, as a result of which, a little later, the aircraft took fire and fell in the region of the town of Petritch.

Adopting the conclusion of the Special Governmental Commission, charged with conducting the inquest of this case, the Bulgarian Government states that the causes of the unfortunate accident of the El-Al aircraft can be summarized as follows:

(1) The plane did not follow its itinerary; it violated the frontier of the State of Bulgaria and, without any preadvice, penetrated deeply into Bulgarian air space.

Equipped with the most perfected means of aerial navigation, the plane could not but have known that it had violated the Bulgarian frontier. Even after having been warned, the aircraft did not obey orders but continued to fly toward the Bulgarian-Greek border.

Certain Haste

(2) The Bulgarian Anti-Aircraft Defense Forces exhibited a certain haste and did not take all the necessary measures to force the airplane to yield to their authority and land.

(3) The Bulgarian Government also thinks that it is necessary to recognize the circumstances that, for many years, certain powers, not observing the sovereignty of the People's Republic of Bulgaria, regularly violated Bulgarian frontiers.

During recent years, many illegal flights over Bulgarian frontiers have been made by aircraft of "unknown nationality." During these illegal flights, diversionists, furnished with arms, radio transmitters and other equipment, were parachuted into Bulgarian territory.

The Government of the People's Republic of Bulgaria has protested on several occasions to the Secretariat of the United Nations, all of which regretfully produced no results. This created a tense atmosphere which necessitated that measures be taken to safeguard the security of the State. It is in such a tense atmosphere that the unfortunate accident to the Israeli airplane became possible.

The Government of the Bulgarian People expresses once more their profound regrets for this great misfortune which has caused the death of completely innocent persons. The Bulgarian Government ardently desires that similar misfortunes should never be repeated. It shall apprehend and punish the persons guilty of the catastrophe which overtook the Israeli airplane and it will take all necessary measures to assure that similar catastrophes shall not be repeated in Bulgarian territory.

The Bulgarian Government expresses its profound regrets to the victims' survivors and is ready to assume the payment of damages due to their families and will also pay for damage to equipment.

Seal of the Minister of Foreign Affairs
People's Republic of Bulgaria
Sofia, August 4, 1955

REPORT ON WRECKAGE AND TECHNICAL INVESTIGATION

As the total time spent on Bulgarian territory by the three investigators was only slightly more than seven hours and of which about 3½ hours were spent on travelling and formalities, they were able to carry out only a limited survey and could not make a complete investigation.

The location of the wreckage was near to the Greek/Bulgarian border on Bulgarian territory about 9 km. N. E. of Petrich. The wreckage was found on the hill 224/281 on the western bank of the river Strumon. The wreckage was scattered on the S. E. and N. W. descents of the hill over an area of approximately 35,000 sq. metres. The topographic height of the hill is 232 m.

The Southeast Side of the Hill

The major part of the wreckage was on the S. E. descent of the hill. The aircraft debris was found scattered, some parts broken into thousands of fragments. It was impossible to examine all the parts

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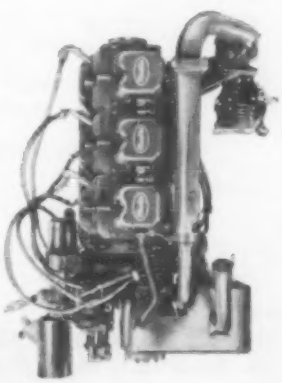

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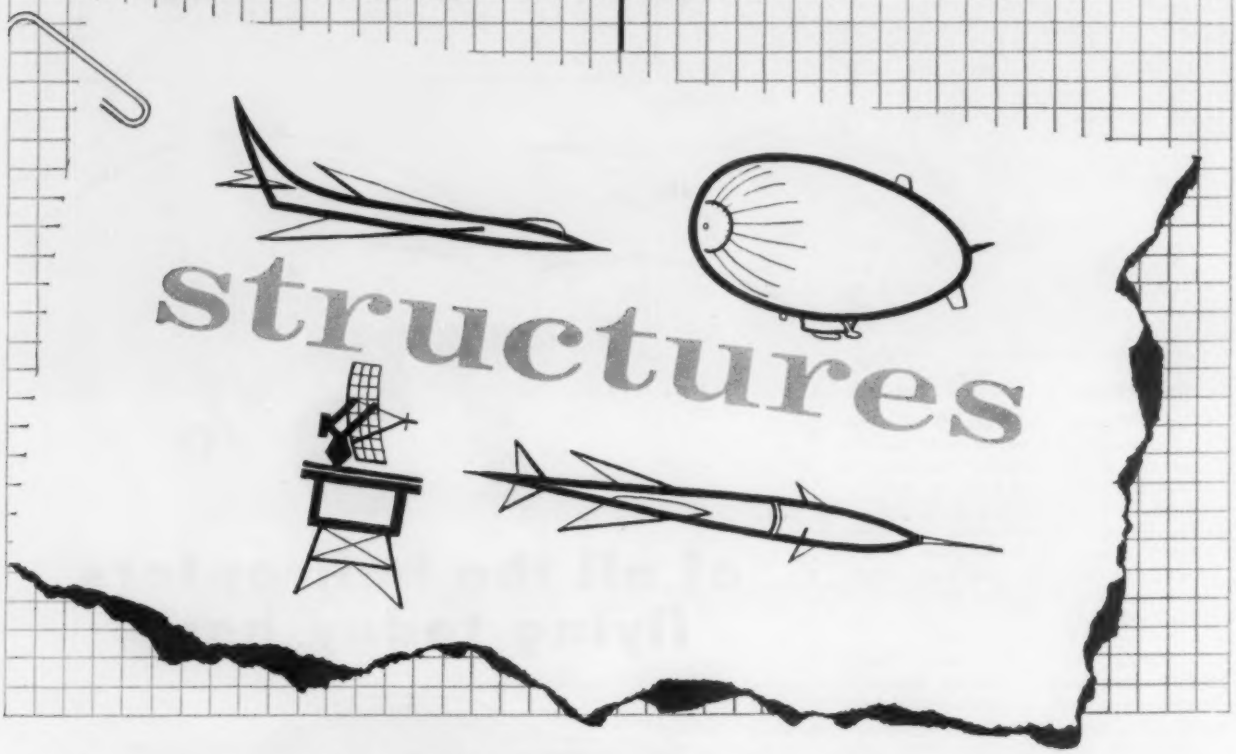

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which were lying around. Therefore, only those parts were examined, which in the opinion of the committee appeared significant.

The following parts and components found in this area were noted:

1. Four engines. One engine had been disassembled and many parts had been removed including 17 out of the 18 cylinders. A second engine was found in the water near the river bank. A third engine was in the river partly submerged. The fourth engine was on the slope of the hill.
2. Two parts of the centre section of the fuselage were found partly in the water. They were punctured by numerous inward pointing round and jagged holes of various sizes. Interior lining was missing from the cabin walls and was scattered on the ground. The lining showed no signs of fire.

   One part of the fuselage was the section where the wings are attached. There were several holes in the fuselage that had penetrated into the cabin in the vicinity of the right heater compartment. There were several large and small holes in the right heater compartment situated in the right wing root. Part of the heater assembly itself—the Janitrol Combustion Heater—made of stainless steel was missing. It had not broken off by impact but had evidently been dismantled.

'Blow-Torch' Fire

In the heater compartment there was a clear indication of a fire in flight with a "blow-torch" effect: aluminum alloy parts had melted away with diminishing effect along a straight path against the direction of flight.

3. The left wing, broken off from the fuselage at the wing attachment fittings, was lying on the ground in one piece. The underside and ribs of the wing had been partly gutted by fire. Nearly all the ribs had sheared off. Part of the wing was less seriously damaged but even here some rivets of the ribs and lower wing skin were sheared off.

   There were a number of jagged and round holes on what remained of the wing skin.

   In the area of the upper surface of No. 2 tank, just behind the rear spar, there were inward pointing holes. In the rear spar web, at approximately W/S 280 there was a round inward penetration, measuring 14 mm. in diameter.
4. One complete undercarriage, with wheels in retracted position, was found in the river.

   The wheel assembly of the second undercarriage was on the eastern bank of the river.
5. The only radio equipment found were two radio sets badly smashed. There were no radio dials.
6. Of the instruments there was only one radio compass showing a heading of 114° and a needle setting of 88°.
7. Some twisted seat structures were found but these accounted only for a small part of all the seats. The rest were missing. A partly burned safety belt

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*28E17-1	30	5	13	8.25	6000	69	AND10266 XVI-A
*28E14-1	40	5	14.5	9.25	6000	83	AND10266 XVI-A
*28E15-1	60	6	16	9.25	6000	100	AND10266 XVI-A
28E19-1	10	6	8.4	6.5	8000	31	AND10262 XII-A
28E19-3	10	6	8.4	6.5	8000	32	New 9" Flange
28E20-1	20	6	8.5	6.5	8000	45	AND10262 XII-A
28E20-3	20	6	8.5	6.5	8000	46	New 9" Flange
28E21-1	30	10	12.4	6.5	8000	60	AND10262 XII-A
28E21-3	30	10	12.4	6.5	8000	61	New 9" Flange
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was noted with the lock closed.

8. Two propeller hubs were found, on one of which there was an entirely undamaged blade.
9. An electrical high tension line of about 6,000 volts, running on the western bank of the river, was found severed, lying on the debris. Two broken wooden poles were on the site, one of them strongly burned.
10. Of the many panels lining the front and rear cargo compartment in the body of the fuselage, only one was found, a vertical panel. It was pierced by 12-15 round holes up to 15 mm. in diameter.
11. Many smaller pieces lying around, not specified above, were pierced by round and jagged holes.
12. There were indentations on the ground where heavy parts had been imbedded but the parts were found quite a distance away, unrelated in their location to the original imprints in the ground.

The Northwest Side of the Hill

On this side the wreckage was more widely scattered than on the south-east side and consisted mainly of major parts.

13. The right wing was broken off at the attachment fittings from the fuselage and broken in three large parts which were lying at a distance of about 80 m. one from another. At the inner part of the inner wing, the skin was separated from the few ribs remaining. The tank area of this part of the wing, between the front and the rear spar, was almost entirely burned out and the metal of sheets and extrusions was melted down.

The ground below the wing showed a fire running down-hill, obviously fed by the remaining fuel of the wing at the time of impact.

In the outer part of the inner wing, in the vicinity of the engine nacelles, there were indications of a less intense fire and there was less destruction than in the inner part. Here it was still possible to find and identify some holes caused by the penetration of projectiles. (Some of these were of large calibre.)

The outer wing carrying the aileron was partly undamaged. Here, too, there was a fire of lesser intensity. The fabric was stripped clean from the aileron which showed no signs of fire.

Fuselage Severed

14. The fuselage between the wing trailing edge and the rear pressure bulkhead was smashed into several pieces, all of them strongly distorted and almost beyond recognition. Here, again, a number of holes of different sizes were noted. All fibre glass and fabric lining of the accessible cabin sections was stripped from the inside of the fuselage. The stewards call button box cover was found unscrewed and open.
15. Three blankets were found near the fuselage, each pressed into a tight plug-like bundle. The smaller end of each bundle was charred.
16. Two complete inner flap sections, lying separately, showed a number of holes.
17. The rear part of the fuselage was severed from the main body at the rear

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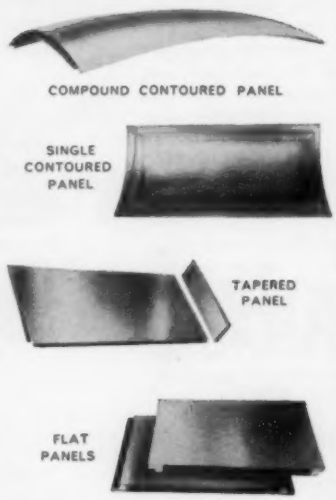

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pressure bulkhead. There was an inward pointing hole on the lower part of the right side aft of the bulkhead. The hole was broad oval in shape with a minimum diameter of 85 mm. The direction of penetration was approximately 15° from the rear to the horizontal centre line of the aircraft. No corresponding outlet to this hole could be found.

The rear pressure bulkhead in this part of the fuselage however was pierced by a great number of round and jagged holes most of them pointing outwards. There was also a large opening torn in the pressure bulkhead.

The bottom segment of the second ring from the tail cone attachment point was pierced by two holes from rear to nose measuring 63 mm. and 75 mm. respectively.

The walking beam of the elevator was found detached from its bracket.

The fuselage structure in the area of attachment of the empennage showed a number of holes.

On the bottom of the fuselage underneath the walking beam attachment brackets there was a jagged opening in the skin with a diameter of 170 mm.

There were indications of a not very intense fire around the emergency elevator booster system apparently sustained by the hydraulic fluid of the main hydraulic system and the emergency booster system including the accumulators situated in this area.

18. The empennage of the aircraft was broken into three pieces which were found 150 metres apart.

Most of the stabilizer and the centre fin were lying near the bottom of the hill. A smaller piece of the stabilizer with the left fin and rudder were close to the top of the hill. The right part of the stabilizer, the elevator and the right fin and rudder were near the bottom of the hill, not severely smashed. Pieces of this section adjoining the fuselage had been cut away with cutting tools and could not be found.

In the structure of the empennage, where it attaches to the fuselage, there were a number of holes.

19. Deicer boots were clearly cut by sharp instruments and some of the sections of regular rectangular shape were missing.
20. The six high pressure oxygen bottles and one walk-around oxygen bottle were found intact.
21. Many major components and sections could not be found. Conspicuously missing was the section of the fuselage from section 290 forward which includes the cockpit.
22. In addition to the holes mentioned in the above description there were many other holes of sizes ranging from 8 to 85 mm.
23. Despite the large number of holes no projectiles or fragments of projectiles were found.

Discussion

The item numbers used in this Discussion refer to the numbers in the Description A above.

1. Nothing was found in the wreckage

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available for inspection to indicate that there have been any defects or failures due to malfunctioning.

2. There was considerable evidence that the wreckage had been interfered with before the committee's arrival. It had been noted that many parts had been removed, including nearly all radio equipment and instruments. These may have provided useful information.

   In addition, many parts had been dismantled, cut away and/or removed. Among these were engine cylinders (Item 1), interior lining (Items 2, 14), the heater (Item 2), most of the seats (Item. 7), portion of the empennage (Item 18), deicer boots (Item 19), and the whole of the cockpit (Item 21).

   Furthermore, marks on the ground indicated that heavy parts had been shifted from the positions in which they had fallen. At least part of the interference above could not have been occasioned by rescue operations.

   In spite of the extensive interference with the wreckage it could be determined that some of the parts were lying where they had fallen. For example, the three pieces of the right wing were in their original position. This was clear from the fact that the fire that had burned in one of the pieces extended to the adjacent vegetation and melted material from all three pieces was lying on the ground beneath the places from which the metal had melted away.

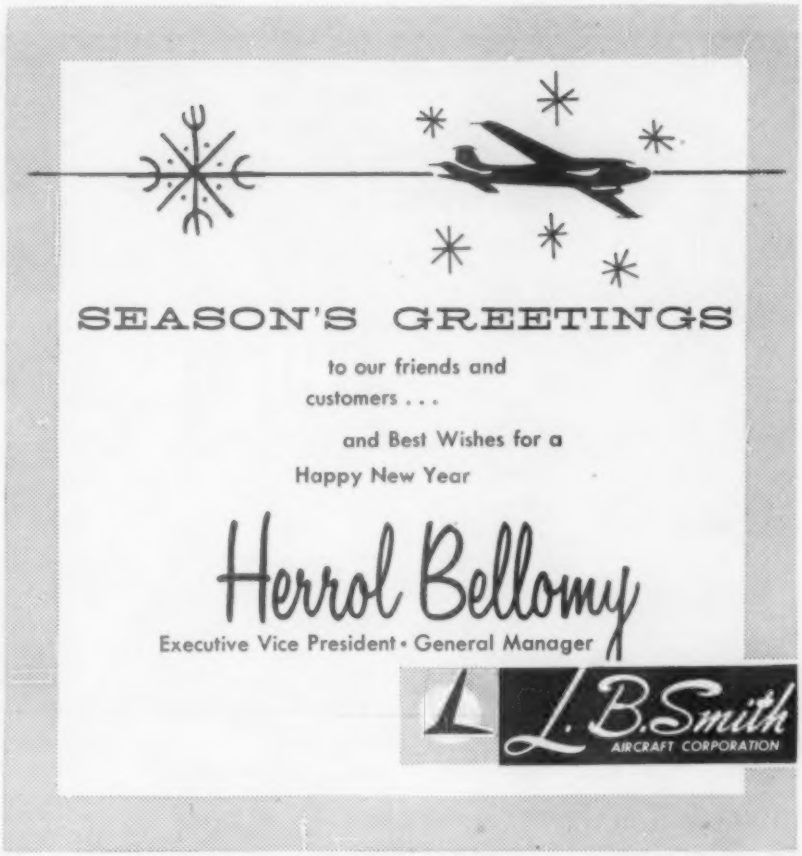
Fire Before Explosion

3. There was a clear indication of a fire having started some time before the final break-up and having continued in flight for several minutes. The evidence for this was the condition of the heater compartment. The fire here must have burned some time in flight in order to have melted the aluminum along a straight part running from fore to aft. The melting of the aluminum decreased along the path. This fire was intensified by the slipstream to which this area was exposed by reason of the holes in the compartment.

   The size of the projectiles that had entered could not be determined owing to the deformation of the material through heat and impact.

4. The three blankets, bundled into plugs and charred at one end suggest that smoke and fire were entering the cabin and efforts were being made to stop the holes. This supports the view expressed above, that a fire had started some time before the break-up. It further indicates that pressurization must have been lost at this earlier stage.

5. The condition of the left wing (Item 3), indicated an explosion. Ribs and rivets were sheared off in a manner that could not have been caused by fire or impact. The round holes in the skin of the wing and in the area of the upper surface of the tank behind the rear spar and the hole in the rear spar web appear to have been caused by bullets. Bullets hitting in this area would cause a fire followed by an explosion. It is probable therefore that the attack on the aircraft, in the course of which these bullet holes were



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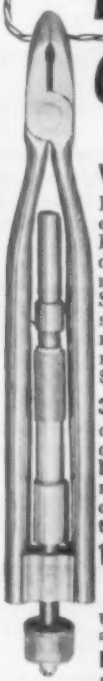

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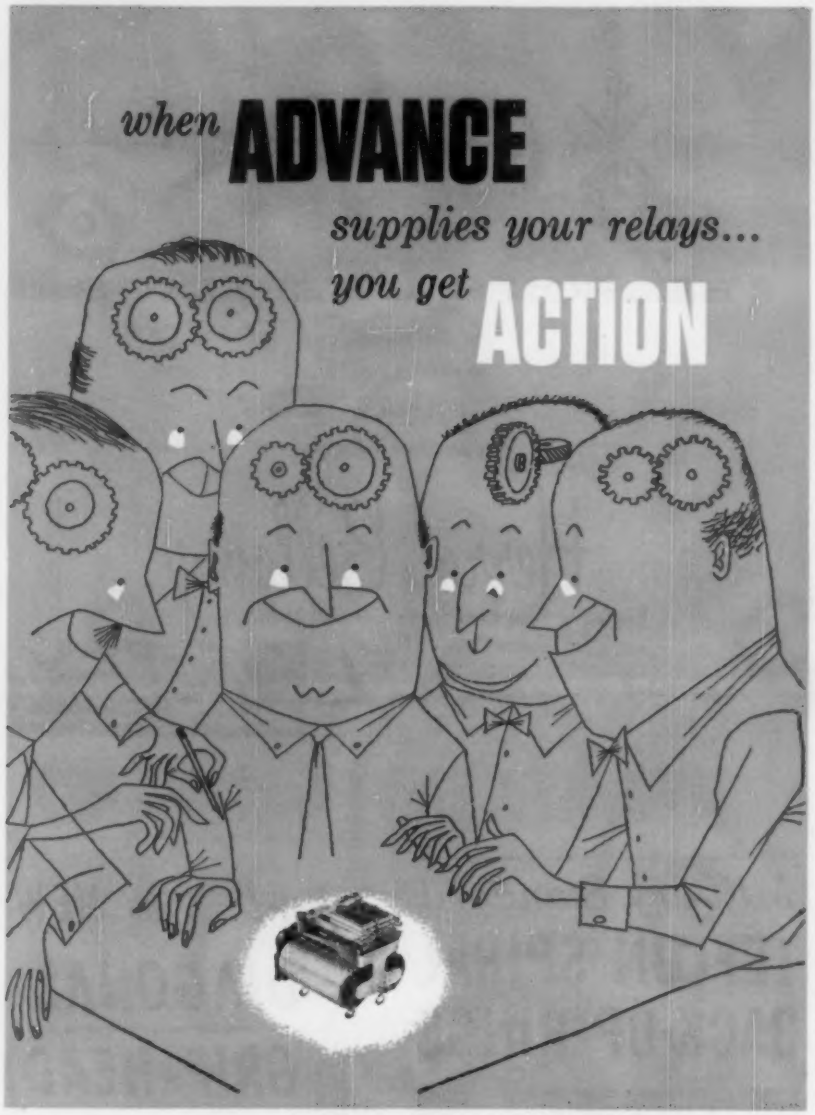

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inflicted, occurred at, or immediately before the final break-up.

6. There was evidence that the right wing had exploded and that the explosion had taken place in mid-air. Rivets holding the ribs to the skin had been sheared off. The three pieces of the wing were lying at a distance of about 80 metres one from the other.

   As explained before, the pieces were where they had originally fallen and could not have been so widely scattered except by mid-air explosion.

7. The numerous holes in the cargo compartment panel were caused by bullets of different calibres. Only one could be measured with reliability from the photographs. Its diameter was 14 mm.

   These holes were round and the panel they penetrated had been in a vertical position. They must therefore have been caused by bullets fired from a direction more or less horizontal to the aircraft.

8. The rear part of the fuselage (Item 17) was heavily pierced by holes, including some of large diameter.

   One of these larger holes was caused by a projectile entering the unpressurized part of the fuselage at an acute angle from the rear. It must have then exploded, cutting the many outward pointing holes in the skin and the forward pointing rents in the rear pressure bulkhead. One of these was a large rent 40×90 cm. From the angle of penetration it can be concluded that the projectile was fired from an aircraft. Its size and explosive effect suggest a rocket.

   The two hits in the second ring from the tail cone in this area were also caused by large calibre projectiles. They must have been fired from the rear.

   The damage they caused could not be clearly determined. They may have brought about the detachment of the walking beam. They may have also caused the fire noted around the emergency booster system.

   The explosive effect of these three large projectiles behind the rear pressure bulkhead, where most of the elevator and rudder control mechanism is situated, would prevent the aircraft from being flown under control.

9. The request to the Bulgarian Government to allow a second access to the wreckage of a committee of two, including the armament expert, was not granted.

   The conclusions arrived at as to the type and size of projectiles which hit the aircraft were reached by the Commission after the armament expert had examined photos and sketches and had received reports on this aspect of the investigation from the three members of the Commission who had had access to the wreckage.

Conclusions

1. Some time before its final break-up the aircraft sustained a hit or hits which caused loss of pressurization and a fire in the heater compartment.
2. The aircraft broke up in mid-air. The cause of the break-up was explosion due to bullets hitting the right wing and probably the left wing together with a projectile or projectiles of large calibre bursting in the rear end of the fuselage.

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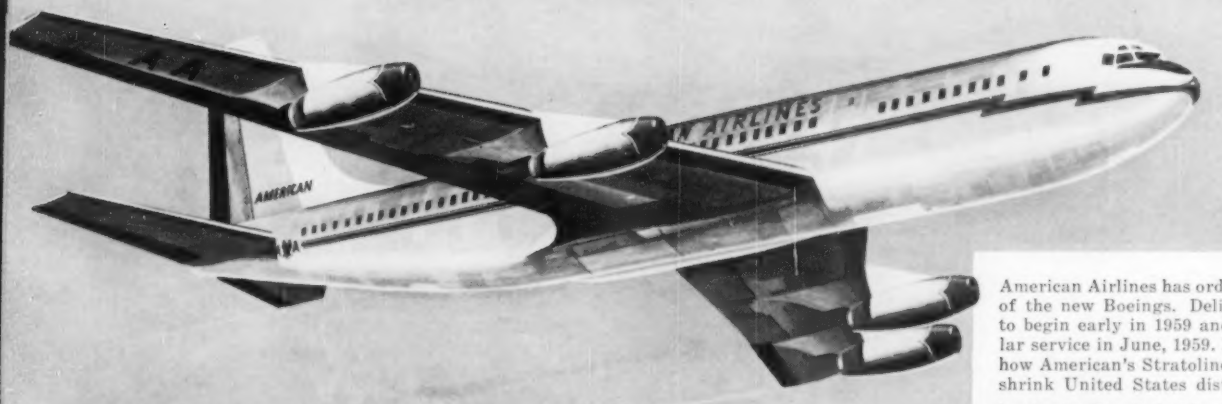

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Examiner Urges Tigers, Slick Renewals

Mail and air express carriage would be permitted without subsidy payment for seven-year period.

By Craig Lewis

Washington—Renewal of the certificates of Slick Airways and the Flying Tiger Line for seven years has been recommended by Civil Aeronautics Board examiner James S. Keith in his report on the east-west phase of the Air Freight Renewal Case.

Keith also advises the Board to allow Slick and Flying Tigers to carry air express and mail with a restriction against subsidy.

Keith favors renewal of the route patterns of both all-cargo carriers on their present inter-area basis, with certain modifications.

Earlier, the Board issued a decision in the severed north-south phase of the Air Freight Renewal Case in which Riddle Airlines and American Air Export and Import Co. were certificated for five years (AW Nov. 28, p. 107).

In the North-South Case, CAB authorized Riddle and AAXICO to carry air express, but deferred their applications to carry mail for decision in the East-West Case. Keith recommends that the CAB authorize all four of the all-cargo airlines to carry mail.

In recommending renewal of the Slick and Tiger certificates, the examiner finds that "the beneficial results of the air freight experiment, the future of the air freight market, and the utility of the all-cargo carrier in fostering its development, as well as the usefulness of such carriers in making available additional facilities for military needs and charters and special services, require the renewal of the air freight experiment for a further test period."

No Subsidy

Keith feels that while the record in the East-West Case is more concrete than it was in the North-South Case, Slick and Tigers haven't shown conclusively that all-cargo services can be operated profitably over any extended period, even with assistance of military charters. Until they make such a showing, the examiner said, they have not laid a foundation for permanent certification.

Referring to the issue of transportation of mail, Keith finds that in view of benefits to the postal service and the small amount of diversion likely, the cargo airlines should be permitted to carry it. The report finds that such an authorization wouldn't commit the Government to subsidizing the operations of the four cargo lines involved.

On the air express issue, the examiner compares the Railway Express Agency to the air freight forwarders and finds that since the forwarders are not prohibited from using the services of the cargo airlines, the Railway Express Agency shouldn't have such a restriction.

"There is no more justification for treating air express as a separate category of property simply because of its identity than there is in regarding air freight handled by the air freight forwarders as a separate type property," he said.

"When a carrier is authorized to engage in the transportation of property there should be no inhibitions in such authority as to items or classes of property, in the absence of strong reasons of public interest. In the present case there are no such reasons."

Keith feels that "if air express service is available and Slick's and Tiger's schedules meet the requirements of the Railway Express Agency, there is no reason why they should not have the opportunity to carry such traffic."

No Prediction

He pointed out that Riddle and AAXICO have already been authorized to perform the service.

The report points out that removal of the restrictions won't accomplish the job of putting air express on the cargo lines, since REA and the passenger airlines have an agreement prohibiting such service. Keith suggests that an appropriate proceeding be instituted if the agreement isn't modified voluntarily.

The examiner feels that the future of air freight lies in volume shipments and depends on the ability of the carriers to bring rates into a competitive position with surface cargo rates. Two important factors will be the development of more economical equipment and better promotion of air freight as a standard means of shipping.

Route Recommendations for Slick, Tigers

The SLICK certificate would be modified to offer service between points in ten city groups. They are:

- Los Angeles, San Francisco/Oakland and San Diego.
- Phoenix.
- El Paso.
- San Antonio, Houston, Fort Worth/Dallas, and Oklahoma City.
- Albuquerque.
- Wichita and Kansas City.
- Pocatello.
- St. Louis, Indianapolis, Cincinnati, Louisville, Dayton, South Bend, Chicago, Toledo, Detroit, Cleveland, Akron and Columbus.
- Nashville.
- Pittsburgh, Hartford/Springfield, Boston, Providence, New York/Newark, Philadelphia, Wilmington, Baltimore, Washington and Richmond.

In the Slick certificate, Keith proposed to have Phoenix, Albuquerque, El Paso, Wichita, Kansas City, Oklahoma City, Pocatello and Nashville served on a demand basis. Baltimore, Akron, Toledo, Columbus, South Bend and San Diego could be served by truck to the nearest regularly served airport.

The FLYING TIGER LINE certificate recommendations included service between six groups of cities.

- Los Angeles, San Francisco/Oakland and San Diego.
- Portland and Seattle.
- Salt Lake City, Denver and North Platte.
- Des Moines and Omaha.
- Akron, Chicago, Cleveland, Detroit, Grand Rapids, Milwaukee, South Bend and Toledo.
- Albany, Binghamton, Boston, Buffalo, Hartford/Springfield, New York, Newark, Philadelphia, Providence and Rochester.

The Flying Tiger certificate would have the condition that service to Salt Lake City, Denver, North Platte, Omaha and Des Moines be furnished on a demand basis and that Providence, Albany, Rochester, Akron, Toledo, South Bend, Grand Rapids and San Diego could be served by means of truck to the nearest regularly served airport.

First Flight of the 'Seven Seas'

The DC-7C, Douglas Aircraft Co.'s newest long-range transport, made its first test flight last week, a two hr., 45 min. flight over Southern California. The airliner, which can carry up to 85 passengers and cruise at 350 mph., is scheduled to be flying transocean routes by late summer. Orders for the "Seven Seas" already have been placed by 10 U. S. and foreign airlines.

Scheduled Lines Protest Nonsked Ruling

Washington—Scheduled airlines have filed strong protests with the Civil Aeronautics Board against the decision in the Large Irregular Case which set up rules for a new class of Supplemental Air Carriers.

Objections were filed to all terms of the decision, but the scheduled carriers concentrated their fire on the controversial ten flight rule which permits a limited scheduled operation.

The carriers also attempted to persuade CAB to extend the deadline for filing petitions for reconsideration and extend the effective date of the new authority which is now Jan. 1, 1956.

The CAB majority which set the terms of the large irregular decision has refused to extend the deadlines and is proceeding with action on the reconsideration petitions.

'Egregious Errors'

A deferral of action could have had a substantial effect on the decision, since member Josh Lee leaves the Board Jan. 1, and Chairman Ross Rizley is reported leaving to accept a Federal judgeship early in January. Both are members of the majority in the Irregular Case. Any shift in the philosophy of the new Board could mean a radical change in the decision if action were put off until after the first of the year.

Protesting the denial of a time extension, American Airlines described the Large Irregular Case as larger in scope, economic impact and size of record than any other previously decided by the CAB.

The carrier said a basic fault in the majority opinion in the case is that it is premised on a state of facts that doesn't exist.

"The nonsked industry it describes is imaginary," American told the Board. "The opinion falls into egregious errors of fact as to what has gone on, as disclosed by this record, among the nonskeds."

American contends the CAB majority is not aware of the effect of the ten flight rule. The carrier says that "once nonskeds are given the right to provide regularly scheduled service wherever they choose, fixed and advertised in advance, even though limited in amount for any one of them, the door is wide open to the provision of daily service by groups of nonskeds, precisely duplicating regular certificated service, without any demonstrable collusion whatsoever."

United Air Lines described the CAB action as an invitation to the irregular carriers to "glut themselves in traffic markets whose resources are required for maintenance of the nation's air transportation system."

In its petition, United said designation of a specific numerical limit on individual passenger flights won't solve the problem of abuses by irregular carriers of the Act. The carrier feels that such a regulation "cannot remove the economic compulsion to conduct route-type operations and to engage in abusive practices toward an innocent traveling public."

Trans World Airlines questions the use of the Board's exemption authority in the decision. The TWA petition said that the use of the blanket exemption to permit 49 irregular carriers to engage in route-type operations constitutes a significant departure from the controlled entry principle. TWA told the CAB its action represents an abandonment of the statutory system of air carrier regulation and is directly contrary to law and the purposes and intent of the Act.

TWA maintains that the theory of the majority that the ten flight rule will provide needed extra capacity dur-

ing peak traffic periods is based on a misconception. Pointing to the North American and Skycoach combines, TWA said that the irregular carriers operate in high density markets on a daily basis, regardless of the space availability on certificated carriers.

TWA also objects to the authority granted the irregular carriers to carry cargo in international operations. The carrier feels that the same reasons which kept the Board from authorizing the irregulars to carry passengers overseas apply to cargo.

Cargo Authority Objections

Pan American World Airways also objects to the international cargo authority. Pan Am points to absence of all-cargo service across the Pacific and the presence of only one U. S. all-cargo carrier in transatlantic service as indication that there is no need for further capacity to handle existing business.

Pan American agrees with the TWA contention that the same reasons which kept the Board from authorizing individually ticketed passenger operations in international service should serve to eliminate scheduled cargo operations for irregular carriers. Basically, the Board decided not to authorize the passenger operations because it felt new competition would be unwise for carriers which still require subsidy.

National Airlines told the Board that the terms of the irregular decision seriously jeopardize the sound development of the air transport system in its request for reconsideration. National also feels that the CAB action will impair the ability of the smaller trunk line carriers to withstand future periods of economic adversity without subsidy aid from the government.

The impact of the newly authorized operations will be especially serious with such carriers as National, according to the petition. The carrier points out that most of its revenue comes from traffic between major points in Florida and the Northeast and that irregular carriers have found these routes attractive in the past.

Airwork-Atlantic Quits U.S. Route; Seaboard Strengthens Position

The Atlantic's only two scheduled all-cargo operators moved in opposite directions last week, with one losing its hold entirely and the other strengthening its position:

• **Airwork-Atlantic, Ltd.**, ceased operations to the U. S. and Canada after less than 10 months service, claiming that lack of support from the British government prohibited any possibility of making a profit on its routes.

• **Seaboard & Western Airlines** strengthened its transatlantic position by ordering three additional Lockheed 1049-H Super Constellation transports at a cost of $6.3 million. The order brings, Seaboard's total 1049-H orders to five airplanes valued at $10.5 million.

An Airwork-Atlantic spokesman termed the carrier's decision as "another tragedy for British aviation." The airline had been led to believe, he said, that the British government would provide some backing by allowing Airwork-atlantic to carry mail and passengers once it had its service established. By continuing to restrict the operation to cargo on its three times a week transatlantic operation, revenues were insufficient to continue flights on an economical basis, he said. The carrier particularly felt the restriction on passengers during the summer months, when travel is at its peak, cargo shipments drop off.

The company had been told by the Minister of Civil Aviation that new legislation would be required to change its operation. The earliest that such action could begin would be in July, and Airwork apparently felt that, even then, government support of such a measure would be lacking.

The company cited other restrictions placed on the Atlantic operation such as placement of 20% import duties on the three DC-6A freighters it had ordered from Douglas. They quoted a rider in the import bill that freed British Overseas Airways on its aircraft purchases. Lack of government support in extension of routes also was cited.

Airwork is negotiating to sell the three DC-6As, although company officials declined to name the purchaser. The first DC-6A is scheduled for delivery in January; the other in March. The carrier also had been negotiating to purchase Bristol Britannia turboprop cargo planes, but "this is now dead," the spokesman said. In another move, Airwork will ask the Port of New York Authority to release it from its negotiations on 7,000 sq. ft. of space at New York International Airport.

On its transatlantic operation, Airwork had been leasing a DC-6A from Slick and two DC-4s from Transocean Airlines, with leasors handling maintenance. For the week ending Dec. 3, it operated 22.22% of the transatlantic scheduled all-cargo flights and carried 31.29% of the air freight, a total of 64,900 lb.

Seaboard & Western will get its first 1049-H in December 1956, with the other four being delivered after that at the rate of one a month. This fleet, along with its four present 1049-D's, will provide the airline with an annual cargo airlift of about 200 million ton-miles. Each 1049-H can carry 19-ton payloads on the North Atlantic, a ton more than the 1049-D Super Connies Seaboard & Western now operates. It believes that the Super Constellation is an economical plane for its present needs.

Seaboard's decision to buy additional 1049-Hs takes it out of the picture as a possible purchaser of Airwork-Atlantic's DC-6A's.

The carrier should benefit directly from the British airline's decision to step out of the transatlantic cargo field. Airwork had ambitious plans to move household goods across the ocean by air, a field that Seaboard also considers very lucrative.

New Denver Decision Sought by Airlines

Washington—Airlines winning new service and route awards in the Denver service decision have returned to the Civil Aeronautics Board seeking modifications in the decision.

Here are the individual arguments:

• **American Airlines** wants the Board to lift the restriction requiring San Francisco/Oakland flights to stop at Chicago, authorize non-stop service between Detroit and Los Angeles and to eliminate the off-route restriction on transcontinental operations to and from San Francisco/Oakland.

• **Trans World Airlines** requests CAB to remove the restriction on the newly authorized Denver services prohibiting St. Louis-Denver and Kansas City-Denver operations. TWA further wants a restriction against United Air Lines' Kansas City award to prohibit Kansas City-Los Angeles services and has strongly urged a reversal of American's authorization for Chicago-San Francisco/Oakland operations.

• **United Air Lines** seeks a modification of its Kansas City award to be allowed to serve both Chicago and Denver on transcontinental flights through Kansas City. Regarding the routes granted other carriers, United particularly objects to the proposed services of Continental Air Lines, Western Air Lines and American. United's petition asks CAB to reconsider and vacate the decision giving American non-stop authority between Chicago and San Francisco/Oakland. They also challenge the validity of the award to Western of a route between Denver and San Francisco/Oakland and the Chicago-Los Angeles non-stop authority given to Continental.

ATA Increases Budget to Stress Mail, Airport, Traffic Programs

By Preble Staver

Washington—An accelerated campaign to promote air transportation was approved by the board of directors of the Air Transport Assn., and backed by a substantial increase in ATA's operating budget.

Here are the areas in which ATA will expand its activities:

- **Nature, benefits** and extent of Federal airline subsidies.
- **Post Office Department** program for shipping surface-mail-by-air.
- **Airports as indispensable** community assets.
- **Financial community** acceptance to satisfy future capital requirements.
- **Regulated competition** as an industry principle.
- **Modernization** of the air traffic control system.

This program means the U.S. certificated scheduled airlines intend to make ATA a more effective industry tool to gain wider public acceptance and understanding of air transportation.

Major part of the new ATA program will be a consolidated public relations effort.

Primary Objective

Stuart G. Tipton, newly elected president of ATA, told AVIATION WEEK that "public relations and community affairs is a primary objective of ATA and we intend to keep it so."

Tipton, 44, has been with ATA as general counsel since 1944. He succeeded Harold Pearson (AW Dec. 19, p. 7).

A graduate of Wabash College and Northwestern University Law School, Tipton was in Government service prior to joining ATA. During 1935-36 he was in the Office of the General Counsel of the Resettlement Administration. In 1936-38 he served in the legislative section of the General Counsel's Office of the Treasury Department where he worked on the draft measure which became the Civil Aeronautics Act of 1938. From 1938-40 he was an attorney for the Civil Aeronautics Authority and during 1940-44 he was assistant general counsel of the Civil Aeronautics Board.

Tipton will direct the "aggressive and positive" industry program that is now expected by the member airlines. To assist Tipton, the board of directors elected one new vice president and created two additional ATA vice presidencies. Neither of the latter posts have been filled but one of the new vice presidents will be for State Affairs and the other for Federal Affairs. All other officers were re-elected.

ATA Membership

Membership of the Air Transport Assn. now consists of 45 certificated scheduled airlines.

Alaska Coastal Airlines was the latest air carrier to become an ATA member. Hawaiian Airlines, however, has notified ATA of an intention to resign from the association effective at the end of the required six-months notice of withdrawal.

Gewirtz Promoted

Stanley Gewirtz, 38, was elected vice president and assistant to the president. He had been executive assistant to the ATA president for the last two years. A graduate of Harvard University law school, Gewirtz previously served as administrative assistant to former Civil Aeronautics Board chairman James Landis and later was a partner in the law firm of Landis, Gewirtz and Maclay.

The main area of responsibility assigned to Gewirtz has been administration, planning and special projects. He will backstop Tipton, who has already instituted weekly ATA staff meetings to achieve greater coordination between departments.

ATA's board of directors approved an operating budget for the first six months of 1956 reflecting a substantial increase over the funds voted for the same period in 1955. Re-affirming the new public relations program, which had its inception a year ago with the election of Willis Player as vice president-public relations, the board voted a total of $240,000 in funds for the department.

The ATA budget also includes $350,000 for air mail, parcel post and military advertising.

New Board Members

Other board actions included resolutions supporting:

- **Legislation** relative to penalties for the malicious destruction or sabotage of aircraft.
- **Presentation** of periodic industry economic reports to the CAB.
- **Modernization** of the U. S. air traffic control system which requires immediate short-term action as well as a program for a completely modernized system in the near future.

ATA's board also suggested exploring the possibility of coordinating or organizing the individual airline attorneys to fight the CAB decision in the Large Irregular Case. Proposals for a code of conduct covering the service of liquor in-flight were passed over for further discussion at the next ATA board meeting in March.

Airline presidents elected to the board of directors were: Robert Six, Continental Air Lines; George Gardner, Northeast Airlines; and Hal Carr, North Central Airlines. They replaced the following retiring board members: Charles Beard, Braniff Airways; Donald Nyrop, Northwest Airlines; and Leslie Barnes, Allegheny Airlines.

Re-elected to the board were: C. R. Smith, American Airlines; Warren Lee Pierson, Trans World Airlines; E. V. Rickenbacker, Eastern Air Lines; Juan Trippe, Pan American World Airways; W. T. Patterson, United Air Lines; George Baker, National Airlines; C. W. Myhre, Frontier Airlines; and Robert Cummings, New York Airways.

Eastern Buys Allison Engines, Propellers

Eastern Airlines last week selected the Allison Model 501 turbo-prop engine and the Aeroproducts A6441FN-606 turbo-propeller to power its fleet of 40 Lockheed Electra airliners. The initial order covering 225 complete power units amounts to approximately $26 million.

Decision to order engines and propellers produced by the Allison Division of General Motors Corp., Captain Eddie Rickenbacker, Eastern's board chairman, said, was due largely to the fact that both propeller and engine units will be backed by a single management.

This, in his opinion, will eliminate the "bug passage" frequently encountered when new airline equipment is purchased.

He also noted General Motors' "commitment of design and engineering resources and the capital needed" to back this power unit as reported in AVIATION WEEK (Dec. 12, p. 27).

Provision was made for the purchase of an additional 150 Allison engine-propeller units for the 30 Electras on which Eastern has an option.

Both Rickenbacker and E. B. Newell, General Motors vice president and Allison general manager, confirmed that one factor which had held up placement of Eastern's order for the 501 engine was the noise problem. Newell says that Allison has progressed far enough with its silencing program to promise noise levels and shrillness no greater than, and perhaps lower than, the piston engines on the DC-7s and Constellations.

CAB Orders

(Dec. 8-14)

GRANTED:

Northwest Airlines an exemption to provide free transportation to technical employes of B. F. Goodrich Co. for inflight observation, for one year.

U. S. Overseas Airlines an exemption to perform a roundtrip charter flight between Paris and New York pursuant to an agreement with a group of Air Force personnel.

United Air Lines an exemption to provide free transportation to technical employes of Sperry Gyroscope Co. for inflight observation, for six months.

Cordova Airlines an exemption to operate between Cape Yakataga and Icy Bay, Alaska, until sixty days after decision on the carrier's application for permanent authority.

Northwest Airlines' application to suspend service at Pusan, Korea, until proper permission for resumption of service can be obtained and made effective.

Leave to intervene in the case involving designation of Tucson as an intermediate point on Route 2 to American Airlines, Frontier Airlines, City of Albuquerque, N. M., City of Amarillo and the Amarillo Chamber of Commerce, City of Kansas City, Mo., and the Kansas City Chamber of Commerce, and the Chamber of Commerce of Wichita. Petitions of Silver City, N. M., and Clifton-Morenci, Ariz., were denied.

Leave to intervene in the case involving service between Cleveland and Pittsburgh to the City of Cleveland and the Cleveland Chamber of Commerce.

United Air Lines and Riddle Airlines leave to intervene in the case involving the petition of American Airlines to modify minimum rate order.

Riddle Airlines leave to intervene in the case involving the petition of Flying Tiger Line to modify minimum rate order.

American Airlines and Trans World Airlines leave to intervene in the Mohawk Airlines permanent certification case.

Trans-Texas Airways' application to omit service at Brownwood, Tex., on all but one roundtrip flight daily over its San Angelo-Dallas route.

Seaboard and Western Airlines an exemption to carry Fred Cowan, an advertising account executive, from the United States to Europe and return.

APPROVED:

Agreements involving United Air Lines, Pacific Northern Airlines and various other carriers relating to intercarrier arrangements.

Agreements involving Air Express International Corp., Universal Transcontinental Corp. and various other carriers relating to intercarrier arrangements.

Agreements involving Capital Airlines, Colonial Airlines and various other carriers relating to intercarrier arrangements.

Delta Air Lines' domestic mail rate set at the rate proposed by the Board in its show cause order for the period May 1, 1953 to Mar. 31, 1954. Delta's motion to exclude the question of the Chicago and Southern employe pension plan is granted.

Delta Air Lines' international mail rates set at the rates proposed by the Board in its show cause order for the period starting May 1, 1953. Delta's motion to exclude the

Rainy Night Over New York

Part III

(This is the third and final column detailing the difficulties inherent in a rainy, Sunday-night flight from Boston to New York's LaGuardia Field.)

On the night of Oct. 30, with ceilings averaging 800 ft. and strong southerly winds, instrument approaches to LaGuardia Field were being made from the Northeast (from the New Rochelle fan marker). Thus, the first problem was to get aircraft into the New Rochelle stack. Two-thirds of LaGuardia's traffic comes from the West so it must cross paths at some point with westbound departures from both LaGuardia and Idlewild.

Departure traffic from Idlewild passes over almost the middle of LaGuardia Field at 6,000 ft. This restricts LaGuardia arrivals to 7,000 ft. until they are northeast of the LaGuardia range station after which they can descend at New Rochelle. If the assigned "slot" at New Rochelle is 4,500 ft., there is a time and altitude waste while the descent is made.

Next an instrument approach must be made from New Rochelle. This is done by using the back course of the ILS (which gives only a localizer beam and no glide path) plus the LaGuardia range station. From New Rochelle to the airport takes about three flying minutes. But, if an aircraft has just begun a procedure turn when the approach clearance is issued, an additional three minutes or more may be consumed before the aircraft gets turned around and starts back in. Six or seven minutes per approach means less than 10 landings per hour.

Visual aids were not of prime importance on this particular night simply because the visibility was never less than eight miles. This was fortunate, because adequate visual aids simply do not exist at New York's busiest airport. All approaches except one are made over the black waters of Flushing Bay towards dim and spotty runway lights. When visibilities are from one to three miles, lead-in lights are needed; below one mile, high intensity approach lights are required.

Provision for dual holding patterns which can feed into the final approach path are scheduled for LaGuardia's system and should help reduce the needed approach time. Equipping the area with more radar will allow a general tightening of present separation standards. But it must not be claimed that radar alone is a panacea. Today's radar is ineffective in rainy weather (when it is most needed) and, unless communications are improved, it will not be fully effective in "good" weather.

The required communications improvement is not only in the air-to-ground link but also point-to-point. We now have Air Route Traffic Control Center to Approach Control to the tower to Ground Control. Four separate stations passing aircraft from one to the other. Because of poor data transfer equipment, "continuous feeding" was not possible on Oct. 30; consequently altitudes lay vacant in the midst of an over-abundant supply of traffic. One hand literally did not know what the other was doing. What is needed is a "unified," continuous system in which controllers do not have to act as separate and distinct "middle men."

In conclusion, it must be pointed out that as usual the controllers were doing the best job they could on Oct. 30. Hour-long delays existed simply because the job was beyond the capabilities of existing equipment—ground and airborne. During the busy evening hours, there were an average of 15 landings and 12 take-offs per hour—not counting helicopter operations.

Oct 30 was a day of "little weather," yet it cost the airlines untold thousands of dollars. The operation at LaGuardia was singled out only because it typifies the traffic situation at busy airports all over the country.

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WEST TRENTON NEW JERSEY

question of the Chicago and Southern employe pension plan is granted.

A general investigation of local air service in North Dakota, South Dakota, Nebraska, Iowa, Illinois, Wisconsin and Minnesota. The Quad Cities-Twin Cities service case will be included in the proceeding.

Piedmont Airlines' authority to overfly London-Corbin, Ky., on flights in excess of one per day extended.

Central Airlines' authority to suspend service at Shawnee, Okla., and Paris, Tex., extended to Feb. 19, 1956.

Delta Air Lines' authority to suspend service at Kingston, Jamaica, extended for one year.

Arthur Vining Davis to execute a trust agreement within ten days transferring his stock in Mackey Airlines and to prosecute with reasonable dispatch his application in Docket 7420. Davis is ordered not to acquire control of or participate in operation of any air carrier or person engaged in any phase of aeronautics otherwise than as an air carrier.

Allegheny Airlines' authority to suspend or omit services at various points has been extended.

Allegheny Airlines issued a permanent certificate of public convenience and necessity.

Suspension and investigation of certain fares between Anchorage and Kodiak, Alaska, and Seattle filed by Aviation Corporation of Seattle.

Piedmont Airlines' authority to serve Ashland, Ky.-Huntington, W. Va., as an alternate to Lexington, Ky., and to serve Princeton-Bluefield, W. Va., on Segments 2 and 4 extended to Feb. 4, 1956. Piedmont is authorized to overfly Princeton-Bluefield on all flights in excess of one round trip daily.

Bonanza Renewal Case reopened for further hearing on the issues of service between Sacramento and Reno and Palmdale-Lancaster and Las Vegas for Southwest Airways and an application by Southwest for Las Vegas-Los Angeles/Burbank segment via Apple Valley and Riverside/Ontario. The reopened hearings also will include the issue of service between Las Vegas and Los Angeles via Apple Valley, Riverside/Ontario and Burbank for Bonanza Air Lines and the addition of Apple Valley to Segment 3 of Bonanza's route.

West Coast Airlines issued a permanent certificate of public convenience and necessity.

West Coast Airlines' authority to alternate or omit service at various points extended.

Mohawk Airlines issued a permanent certificate of public convenience and necessity.

Mohawk Airlines' authority to operate over various routes and to suspend or omit service at various points extended.

DISMISSED:

Investigation of a Pan American World Airways fare for travel on cargo aircraft from Fairbanks to Seattle, since the fare expired by its own terms and never became effective.

Investigation of a Trans World Airlines roundtrip excursion fare between Las Vegas and San Francisco, since the fare has been cancelled.

Southeastern Helicopter Service's application for helicopter service within the State of Florida, since the CAB has been advised the corporation is now non-existent.

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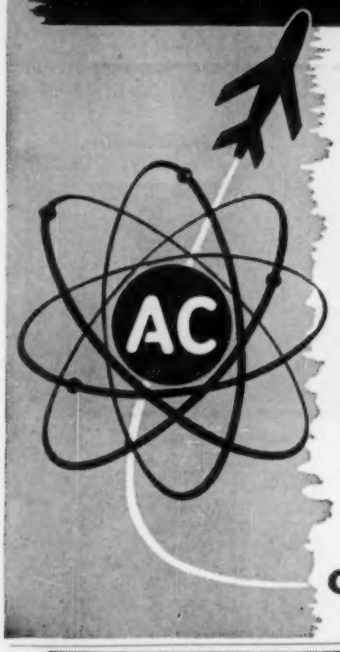

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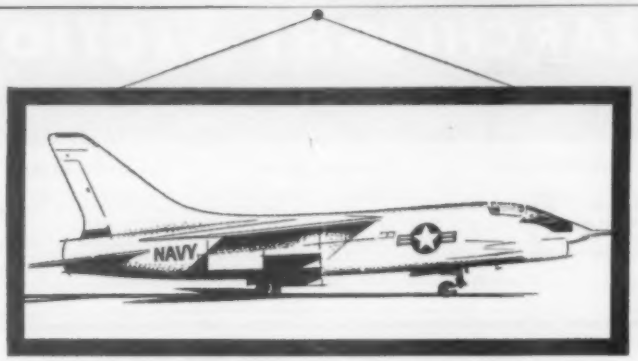

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ADVERTISERS IN THIS ISSUE

AVIATION WEEK—DECEMBER 26, 1955

ADVANCE ELECTRIC & RELAY COMPANY..... 76
Agency—Waldie and Briggs, Inc.

AIRBORNE ACCESSORIES CORP..... 8
Agency—Gray & Rogers Adv.

AIRCOOLED MOTORS, INC..... 67
Agency—Richards & Webb, Inc.

AIRCRAFT EQUIPMENT TESTING COMPANY.... 8
Agency—Mahool Advertising, Inc.

AVIATION DEVELOPMENTS, INC..... 31
Agency—Jaycraft Co. Adv.

BOEING AIRPLANE COMPANY..... 78
Agency—N. W. Ayer & Son, Inc.

CAMBRIDGE CORPORATION 61
Agency—Mahoney & Howard, Inc.

CANNON ELECTRIC COMPANY..... 85
Agency—Willard G. Gregory & Co., Inc.

CHICAGO AERIAL INDUSTRIES..... 46
Agency—Leonard Advertising

CLEVELAND PNEUMATIC TOOL CO..... 44
Agency—Meldrum & Fewsmith, Inc.

CONVAIR A DIVISION OF GENERAL DYNAMICS CORP..... 71
Agency—Thomas L. Yates Adv.

DOUGLAS AIRCRAFT CO., INC..... 74
Agency—J. Walter Thompson Co.

EDO CORPORATION 93
Agency—Davis, Parsons & Strohmeier, Inc.

EX-CELL-O CORPORATION 57
Agency—Holden-Chapin-Larue, Inc.

FAIRCHILD ENGINE & AIRPLANE CORP.....30, 73
Agency—Gaynor, Colman Prentis & Varley, Inc.

GENERAL ELECTRIC COMPANY....47, 48, 49, 64, 65
Agency—G. M. Basford Company

GENERAL LABORATORY ASSOCIATES, INC..... 63
Agency—Riger and Sheehy Adv.

GOODRICH CO., THE B. F..... 3
Agency—Batten, Barton, Durstine & Osborn, Inc.

GOODYEAR AIRCRAFT CORP..... 68
Agency—Kudner Agency, Inc.

GRUMMAN AIRCRAFT ENGINEERING CORP. .....Front Cover
Agency—Fuller & Smith & Ross, Inc.

HARNISCHFEGER CORPORATION (WELDING DIV.) 24
Agency—Hoffman & York, Inc.

HAWKINSON CO., PAUL E..... 45
Agency—Fischbein Advertising Agency

HEXCEL PRODUCTS CO., A DIV. OF CALIFORNIA REINFORCED PLASTICS CO.... 20
Agency—Charles P. Johnson Co.

HYDRO-AIRE, INC. 59
Agency—Roy S. Durstine, Inc.

KAISER ALUMINUM & CHEMICAL SALES, INC.. 60
Agency—Young & Rubicam, Inc.

LEACH CORPORATION (INET-PALMER DIV.) .....Third Cover
Agency—Hixson & Jorgensen, Inc.

LEAR, INC., ROMEC DIV..... 33
Agency—Buchanan & Co., Inc.

LOCKHEED AIRCRAFT CORP..... 50
Agency—Foote, Cone & Belding

MARQUARDT AIRCRAFT COMPANY..... 54
Agency—Heintz & Co., Inc

McGRAW-HILL PUBLISHING CO., INC.....34, 35
MILLS MANUFACTURING COMPANY..... 32
Agency—Burnley Weaver Adv.

NORTH AMERICAN AVIATION, INC. (COLUMBUS DIV.) 60
Agency—Batten, Barton, Durstine & Osborn, Inc.

PASTUSHIN AVIATION CORP..... 10
Agency—Lynn-Western, Inc.

PATENT PRODUCTION DEPARTMENT..... 32
Agency—Evers Whyte Agency

RADIO CORP. OF AMERICA (ENGINEERING PRODUCTS DIV.)..... 38
Agency—Al Paul Lefton Co., Inc.

REACTION MOTORS, INC..... 28
Agency—J. Wheelock Associates

RED BANK DIV., BENDIX AVIATION CORP..... 70
Agency—MacManus, John & Adams, Inc.

RESISTOFLEX CORP. 75
Agency—Marsteller, Rickard, Gebhardt and Reed, Inc.

RHEEM MFG. COMPANY, GOVT. PRODUCTS DIV..... 19
Agency—Campbell-Ewald Co.

ROBINSON CO., RALPH C..... 75
Agency—Chapin-Danm Adv.

ROHR AIRCRAFT CORPORATION..... 62, 72
Agency—Barnes Chase Company

SEARCHLIGHT SECTION 85, 86, 87, 88, 89, 90, 91, 92

SERVOMECHANISMS, INC. .....Fourth Cover
Agency—Sanger-Funnell, Inc.

SKYLINE PRODUCTS, INC. (AVIATION DIV.).... 83
Agency—Triton Advertising

SOLAR AIRCRAFT COMPANY..... 86
Agency—The Phillips-Ramsey Co. Adv.

SPERRY GYROSCOPE CO., DIV. SPERRY RAND CORP..... 60
Agency—Equity Adv. Agency

STRATOS A DIV. OF FAIRCHILD ENGINE & AIRPLANE CORP..... 58
Agency—Gaynor, Colman Prentis & Varley, Inc.

STROUKOFF AIRCRAFT CORP..... 84

SUNSTRAND MACHINE & TOOL CO.....Second Cover
Agency—Howard H. Monk & Associates

SUTORBILT CORPORATION 83

WEBER AIRCRAFT CORP..... 77
Agency—Charles Bowes Adv., Inc.

WESTERN GEAR CORP..... 36
Agency—Ruthrauff & Ryan, Inc.

WHITTAKER GYRO, INC..... 4
Agency—Mogge-Privett, Inc.

WYMAN GORDON CO..... 6
Agency—John W. Odlin Co., Inc.

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EMPLOYMENT OPPORTUNITIES 85-91
SPECIAL SERVICES TO THE INDUSTRY..... 91
PLANES—EQUIPMENT (Used or Surplus New) For Sale 92
WANTED Planes—Equipment 92

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EDITORIAL

Congress Should Investigate CAA

A congressional investigation into the Civil Aeronautics Administration early next year is now certain. Sen. A. S. Mike Monroney, a Democrat from Oklahoma who is chairman of the Aviation Subcommittee of the Interstate and Foreign Commerce Committee, will spark the investigation.

Sen. Monroney is now interested mainly in whether civil aviation is being crippled by a "railroad-dominated" group of top level Commerce Department officials and whether recently-sacked CAA Administrator Frederick B. Lee was a martyr in this cause.

While there was evidence that the future growth of aviation was being restricted by budget-cutting policies during the first years of the Eisenhower Administration, that policy has switched in the face of the growing crisis in air traffic control.

Official Alarm

Top level Administration officials including those in the Commerce, Defense and Budget Bureau bailiwicks are now thoroughly alarmed over the civil and military consequences of the rate at which air traffic is outstripping the system for identifying and controlling it.

When he concludes his investigation into CAA-Commerce Department relations we strongly recommend that Sen. Monroney direct the effort of his subcommittee to probing the current crisis in air traffic control. If he can develop a complete and accurate record on the history of this crisis plus present and future plans for handling it, Sen. Monroney will indeed be doing his fellow members of Congress and the American people a real service. For, as we have emphasized before, this problem directly concerns every American citizen who buys an airline ticket or who pays Federal taxes for the support of effective military airpower.

Questions for Probers

Here are some of the questions Sen. Monroney and his colleagues should ask Secretary of Commerce Sinclair Weeks, Under Secretary Louis Rothschild, the new CAA Administrator Charles J. Lowen, his predecessor Frederick B. Lee, and other witnesses from the Air Coordinating Committee, the Budget Bureau's Harding advisory group, the Air Navigation Development Board and the Pentagon:

Why has the Civil Aeronautics Administration airways and air traffic control system consistently lagged far behind the growth of air traffic?

How much of CAA's current and future planning for airways equipment duplicates equipment already installed or budgeted by the Air Force and Navy?

Why does the CAA shut off its traffic control radar at the tightly congested Chicago, Washington and New York airports when it rains and the traffic control problem is worst?

Did CAA have any electronic airways development plan at all until early this fall?

Did top level CAA officials juggle air traffic figures at some airports to justify an instrument landing system installation where actual traffic did not justify it?

Were these airports in political districts where CAA sought congressional support for its policies?

Did this action deprive heavily congested areas of dual ILS installations acutely needed to handle current traffic loads?

Why does London Airport have dual ILS installations and multiple high intensity approach light installations when no major U. S. airport is so equipped?

Why are there five different approach light systems currently installed on U. S. airports?

How and why did the Special Working Group 13 (SWG-13) of the Air Coordinating Committee come into existence?

Why did a CAA traffic controller write that he was "tired of continually writing letters to the regional administrator explaining near misses" of air traffic due to faulty operations of his control center?

Why do experienced CAA traffic controllers transfer out of overloaded centers to areas where traffic is light?

What did the Harding advisory group report to top level Budget Bureau and Commerce Department officials on the effects of the air traffic control problem on civil and military aviation?

Is it necessary to establish a special air traffic control agency operating both Federal airways and traffic control centers and the military air defense warning net to furnish both CAA and the military with the air traffic data they must have to perform their respective missions?

What will it really cost the taxpayers in effective air defense, air transport safety and dollars if the CAA and the Pentagon fail to develop a common electronic airways and air defense system that will meet the requirements of supersonic interceptors and jet transports?

Future at Stake

There is a fertile field for congressional investigation along these lines. For it is Congress that will have to authorize any new legislation and appropriate the billions for the establishment and operation of the new system. Congress and the American people are entitled to know the facts on this growing crisis in air traffic control for it vitally affects the economic and military future of our nation.

—Robert Hotz

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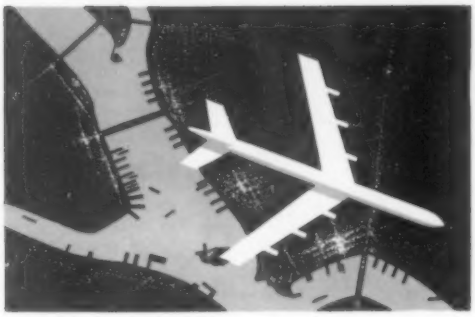

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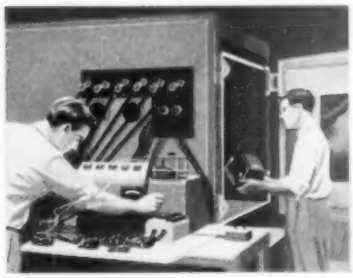

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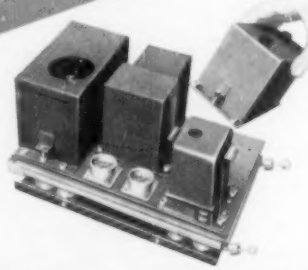

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